GRANULAR AGGREGATE RESOURCES
McADAM (NTS 21 G/11) AND FOREST CITY (NTS 21 G/12)

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Mineral Resources Division
Department of Natural Resources
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ABSTRACT

This report provides an evaluation of the distribution, extent, thickness, and quality of surficial granular aggregate deposits in the McAdam (21 G/11) and Forest City (21 G/12) map-areas. The major aggregate deposits are outlined on the accompanying maps, while the report outlines the mode of origin of the deposits and their general characteristics. Quality test results and calculated reserve volumes are also presented.

Approximately three-quarters of the granular aggregate reserves are found in the lower Magaguadavic River valley, in the form of glaciofluvial outwash, and, to a lesser extent, ice-contact stratified drift deposits. The bulk of the remaining reserves are found as ice-contact and outwash deposits associated with tributaries of the Magaguadavic River.

Total workable reserves of fair to excellent quality material in the McAdam area are estimated to exceed 40 million m^3. Workable reserves of such material in the Forest City area amount to approximately 170,000 m^3. Approximately half of these total volumes are comprised of fine deposits with little, or no, gravel potential. In addition to the above, extensive quantities of poor quality material are present in ablation till deposits in both areas.

RESUME

La présente étude fournit une évaluation de la répartition, de l'étendue et de la qualité des dépôts d'agrégats granuleux présents à l'intérieur des limites des feuillets topographiques McAdam (21 G/11) et Forest City (21 G/12). L'étude comprend un rapport qui esquisse le caractère général ainsi que le mode d'emplacement des principaux dépôts. On présente également les résultats de tests qualitatifs ainsi que le volume des réserves d'agrégats. Le tout est accompagné de cartes où sont délimités les principaux dépôts d'agrégats.

On trouve environ trois quarts des réserves en agrégats dans le cours inférieur de la rivière Magaguadavic, principalement sous la forme d'épandages fluvioglaciaires mais aussi de sédiments de contact glaciaire. La portion restante des réserves est comprise dans des dépôts de contact glaciaire et d'épandages fluvioglaciaires associés aux tributaires de la rivière Magaguadavic.

Le total des réserves de matériel de qualité bonne à excellente dans la région de McAdam est évalué à plus de 40 million m^3, et à 170,000 m^3 dans la région de Forest City. A peu près la moitié de ces réserves contiennent surtout du sable et peu de gravier. En plus des sources mentionnées ci-haut, de larges quantités de matériel de moindre qualité sont présentes dans les deux régions sous forme de till d'ablation.

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INTRODUCTION

Location of the study area

The McAdam (21 G/11) and Forest City (21 G/12) map-areas cover a combined area of approximately 1330 km^2 in southwestern New Brunswick. This area is bounded by the International Border to the west (as defined by the St. Croix River system), by Longitude 67°00' west to the east, and by Latitudes 45°30' and 45°45' north (Figure 1). Harvey and McAdam are the major communities within this area.

Provincial highways 3 and 4, and local highways 630, 635, and 636 pass through portions of the area. Access to most of the area is reasonably good, due to a few local roads and an extensive network of logging roads which branch off from these highways. While access to a few areas is poor, most of the significant aggregate deposits are easily accessible.

The present study

The aim of this study is to provide basic information about the location, extent, thickness and quality characteristics of the granular aggregate deposits in the McAdam and Forest City map-areas. As such, it comprises part of a province-wide inventory of granular aggregate resources.

Fieldwork was undertaken during the summer and fall of 1981. This involved the examination of man-made and natural exposures throughout the study area, and the description and sampling of representative sections. For those deposits with a significant gravel content, a sample of approximately 100 pebbles in the 25

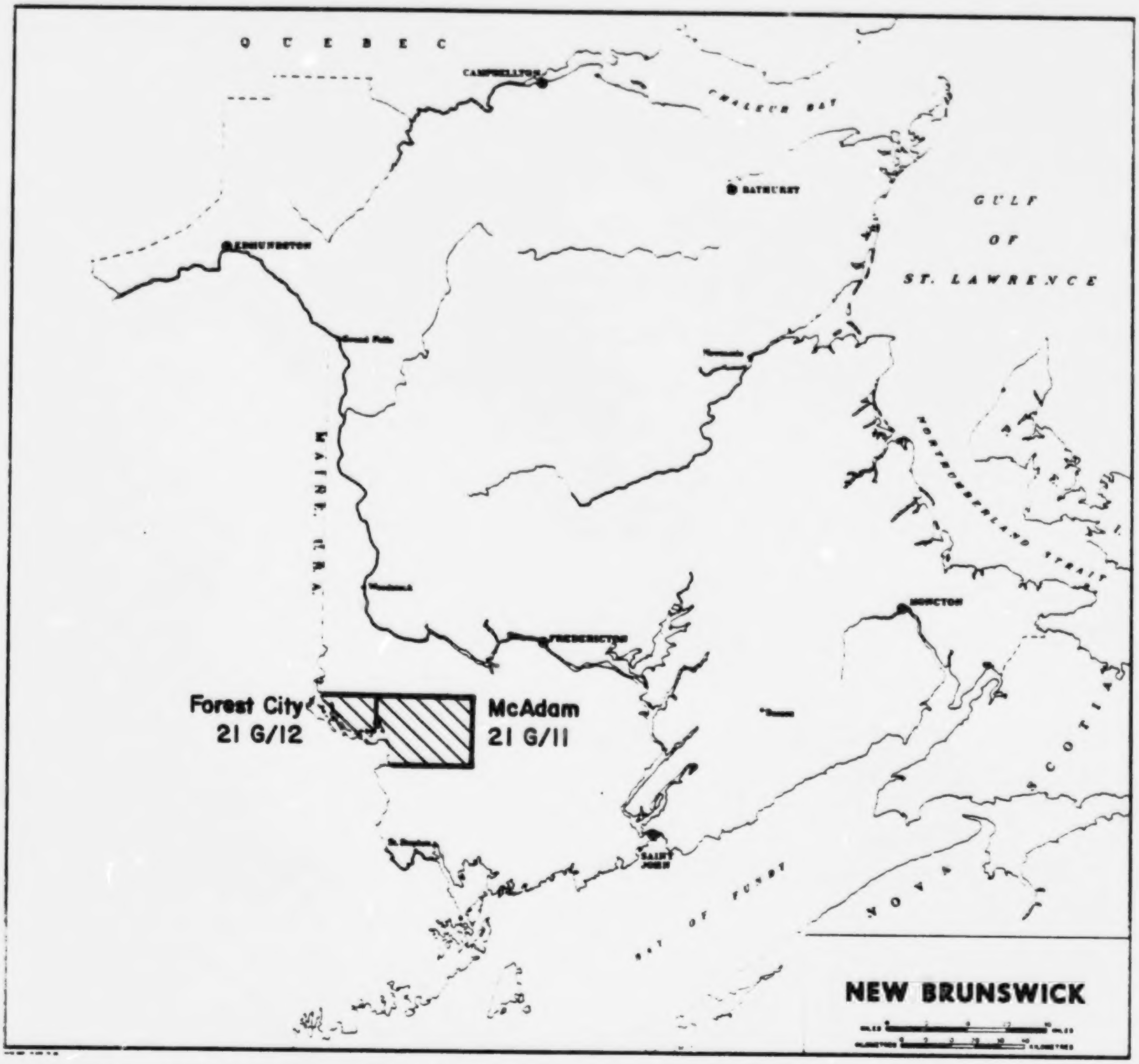

QUEBEC
CAMPBELLTON
CHALEUR BAY
BATHURST
GULF OF ST. LAWRENCE
EDMUNDSTON
NORTHUMBERLAND STRAIT
MAINE U.S.A.
FREDERICTON
MONCTON
Forest City
21 G/12
McAdam
21 G/11
SAINT JOHN
BAY OF FUNDY
NOVA SCOTIA
NEW BRUNSWICK

Figure I. MAP SHOWING LOCATION OF THE STUDY AREA

projecting section heights observed in pit sections and in other natural and man-made exposures to areas beyond the exposures, based on geologic and topographic considerations. The estimated workable area is that area which is not subject to obvious physical restrictions (ie. the presence of highways, buildings, boggy areas, etc.).

Summary of previous work

Aspects of the surficial geology of the study area are outlined in the early work on the surficial geology of New Brunswick (Chalmers, 1884, 1885, 1902; Hind, 1865; Mathew, 1879). Much of the information is in the form of observed striations and inferred ice flow directions. However, Chalmers (1884, 1902) also provides descriptions of some deposits, and comments on the glacial history.

Some information pertaining to the surficial geology of the study area is also provided by the soil survey report on southwestern New Brunswick (Wicklund & Langmaid, 1953). More recently, the surficial geology of the area has been mapped at a scale of 1:250,000 by Gadd (1973), who provides a concise summary of the history of deglaciation. A few of the individual deposits within the area have been described by Hamilton & Carroll (1975) in their province-wide inventory of sand and gravel resources.

Information on the bedrock geology is obtained from maps by Clark (1961a, 1961b) for the McAdam area, and by Smith (1966) for the Forest City area. A compilation map at a scale of 1:250,000 is also available (Potter, 1968).

PHYSIOGRAPHY AND BEDROCK GEOLOGY

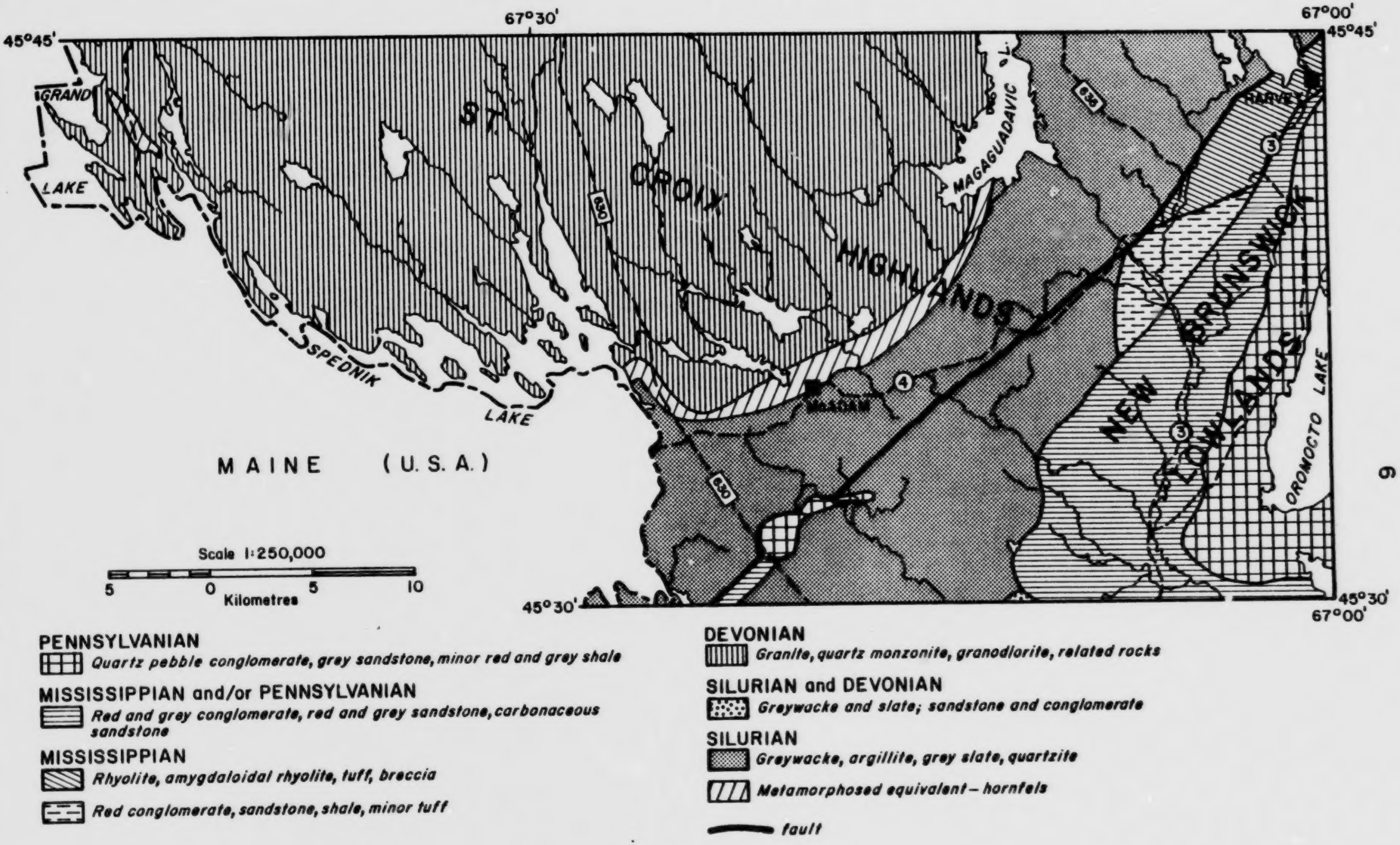
Physiographic subdivisions and geology

The McAdam/Forest City area lies within the Appalachian physiographic region of eastern Canada (Bostock, 1970), and contains elements of two major physiographic divisions: the St. Croix Highlands portion of the New Brunswick Highlands, and the New Brunswick Lowlands portion of the Maritime Plain (King, 1972). Of these, the former is predominant within the area, the lowlands occupying only a small area to the southeast, adjacent to Oromocto Lake.

The New Brunswick Lowlands are underlain by generally flat lying sedimentary rocks of Carboniferous (Mississippian-Pennsylvanian) age, predominantly conglomerates and sandstones within the study area (Figure 2). The St. Croix Highlands comprise a rolling terrain developed primarily on resistant rocks (King, 1972), in this area comprising predominantly Silurian greywackes, slates, and argillites, and Devonian granites (which locally exhibit deep weathering), with lesser contact metamorphic rocks and Mississippian rhyolites (Figure 2).

Topography

The granitic terrain of the Forest City map-area and the northwestern portion of the McAdam map-area exhibits a rugged, rolling topography. The local relief varies from less than 20 m to in excess of 150 m, with an average relief in the order of 60 to 70 m. The maximum elevation within the study area is the 297 m AMSL (above mean sea level) summit of Cranberry Ridge in


67°30'
67°00'
45°45'
45°45'
45°30'
45°30'
67°00'
GRAND
LAKE
ST. CROIX HIGHLANDS
SPEDNIK
LAKE
MAGAGUADAVIC L.
630
McADAM
4
3
3
HARVE
NEW BRUNSWICK LOWLANDS
OROMOCTO LAKE
MAINE (U.S.A.)
Scale 1:250,000
5
0
5
10
Kilometres
PENNSYLVANIAN
Quartz pebble conglomerate, grey sandstone, minor red and grey shale
MISSISSIPPIAN and/or PENNSYLVANIAN
Red and grey conglomerate, red and grey sandstone, carbonaceous sandstone
MISSISSIPPIAN
Rhyolite, amygdaloidal rhyolite, tuff, breccia
Red conglomerate, sandstone, shale, minor tuff
DEVONIAN
Granite, quartz monzonite, granodiorite, related rocks
SILURIAN and DEVONIAN
Greywacke and slate; sandstone and conglomerate
SILURIAN
Greywacke, argillite, grey slate, quartzite
Metamorphosed equivalent – hornfels
fault

Geology modified after Clark (1961 a,b), Potter (1968)

Figure 2. BEDROCK GEOLOGY

the extreme northwestern corner of the McAdam map-area. The summits of approximately 30 to 40% of the major hills within the granitic area exceed the 250 m AMSL level. In contrast, the lakes bordering this area lie approximately 116 to 132 m AMSL.

The most striking aspect of the topography of the predominantly sedimentary terrain to the south and east is the occurrence of three subparallel escarpments. The first of these, defined by Prospect Ridge, a portion of Howland Hill, and possibly the hill at Magaguadavic on the east side of Magaguadavic Lake, marks the contact between the granitic rocks and the adjacent Silurian sedimentry rocks. This escarpment is apparently a product of differential erosion, the metasedimentary rocks being more resistant than the coarse grained, more easily weathered, granitics. This escarpment has a maximum relief of approximately 130 m, and an average relief of approximately 70 to 80 m.

A second discontinuous escarpment appears to be associated with a major fault extending from Harvey through to the St. Croix River at the southern edge of the study area (see Figure 2). Near Harvey, where Mississippian rhyolites (to the southeast) are in fault contact with Silurian sedimentary rocks, the rhyolites form a scarp with a maximum relief of 80 to 100 m. To the west, the fault trace appears to be marked only by a low hill within Silurian age rocks at Christie Ridge, and by an outlier of resistant Pennsylvanian conglomerate forming Brandy Hill (approximately 80 m of relief).

The third escarpment, lying to the west and south of Oromocto Lake is defined by Shaving Ridge and Vails Ridge. This escarpment marks the contact between resistant Pennsylvanian conglomerates and sandstones (to the east) and more easily erodible Mississippian and/or Pennsylvanian redbed sediments, and is a result of differential erosion. It appears to merge into the second escarpment near Harvey. Maximum relief is in the order of 70 to 80 m.

Drainage

The surface of the McAdam/Forest City area exhibits a glacially deranged drainage pattern. Such a pattern is characterized by the presence of a multitude of ice-scoured and drift-dammed basins occupied by lakes and bogs. The Chiputneticook Lakes, Magaguadavic Lake, and Oromocto Lake are the most significant examples.

Drainage is predominantly southwards, via the St. Croix and Magaguadavic River systems, and, to a lesser extent, the Digdeguash River. However, Oromocto Lake and a few small streams at the northern extremities of the study area lie within the St. John River drainage basin, and drain northward and eastward.

SURFICIAL GEOLOGY

Introduction

As noted by Gadd (1973, p. 3), "abundant evidence of glacial abrasion and deposition testifies to the complete glaciation of the map-area." This evidence occurs in the form of numerous glacially smoothed and striated outcrops, and in the widespread distribution of till and glacial erratics, extending to the summits of the highest hills within the area. Due to the lack of any evidence to the contrary, these glacial events are inferred to relate to Late Wisconsinian time, as was also assumed by Gadd (1973).

Evidence of pre-Wisconsinian events are present. Locally within the study area, weathered rocks (mostly granite, but some sandstone), frequently overlain by till, have been observed. Anderson (1968) has described similar material, occasionally in excess of 6 m in thickness, from the Millville area (21 J/13) to the north, which he ascribes to weathering during pre-Pleistocene (probably Carboniferous) times.

Glaciation

Evidence, in the form of abundant striations, small- and large-scale crag-and-tails, and fluted till and bedrock surfaces, indicates that the last main glacial flow across the McAdam/ Forest City area was predominantly southeastward, as has been reported by Gadd (1973). However, striations and small-scale crag-and-tails also indicate previous flow directions towards the east (approximately 100°) and towards the south (approximately

170°). Evidence for the easterly ice flow direction extends across the McAdam map-area. However, the southerly flow direction is recorded only around Oromocto Lake. One or more of these three different directions have been recorded by the early workers in the area (Chalmers, 1884, 1885, 1902; Hind, 1865; Mathew, 1879).

Due to the presence of fluted surfaces, which are indicative of the last major flow direction, it appears that the southeasterly flow direction was the latest. No evidence was observed to indicate the chronological relationship between the other two directions. However, Chalmers (1902) felt that the easterly flow was the first, followed by the southerly flow, and then the southeasterly flow. To the east of Oromocto Lake, the latest ice-flow direction was southward (Gadd, 1973; Thibault, 1981). It thus appears that Oromocto Lake marks the approximate boundary between two ice lobes, the western one flowing southeastward, and the eastern one southward, as has been suggested by Gadd (1973). Fluctuations in the boundary position could account for the occurrence of striae representing both directions in the area around Oromocto Lake. However, it is possible that the southward flow was latest, since Gadd (1973) postulates the presence of a late-stage lobe in the Oromocto Lake basin.

The striae indicating eastward flow may relate to an extensive, earlier glacial stage. Genes et al (1981) have reported the occurrence of a subsurface till in northern Maine with an eastward oriented fabric, in an area where surface features indicate that the latest flow direction was southeastward. They feel that this till may be of Middle Wisconsinian age. Meanwhile, Rampton & Paradis (1981) report the occurrence of early, eastwardly oriented striae near Woodstock. It is possible that all of these indicators of eastward movement may be correlative.

Subsequent to the striation of the bedrock surfaces, a veneer of lodgement (or basal) till was deposited by the glacier. Observations indicate that this material is generally silty to sandy, and stony. It is frequently very bouldery, and generally dense. Gadd (1973) indicates that it is generally discontinuous and thin over bedrock areas, and from 1 to 3 m thick in till plains.

Deglaciation

With the onset of climatic amelioration, the ice covering southwestern New Brunswick began to recede from the area as the ice thickness decreased due to ablation. Stuiver & Borns (1975) have indicated that in Maine the ice recession from the current coastal position commenced approximately 13,000 yBP (years before present). However, Scott & Medioli (1980) indicate that deglaciation may have commenced prior to 16,000 yBP, a possibility also suggested by Gadd (1973). Total deglaciation of the McAdam/Forest City area was probably completed prior to 12,000 yBP, since Rampton & Paradis (1981) indicate that the area immediately north of the St. John River valley was deglaciated prior to that time.

During the Shin Creek Phase of Gadd (1973), ice-marginal recession was halted temporarily at a position to the south of the McAdam/Forest City area. During this time, the ice mass covering the area was drained by the river valleys to the south (Gadd, 1973; see also Thibault, 1982) while subglacial drainage systems developed in the St. Croix and Magaguadavic River drainage basins. The subglacial drainage pattern is indicated by the distribution of eskers, and of subglacially scoured gorges.

Subsequent to the Shin Creek Phase, ice-marginal recession recommenced, and the ice began to receed from the study area. During this recession, large quantities of ablation till were deposited in the valleys and low-lying areas, frequently in the form of morainic ridges. These ridges are oriented approximately perpendicular to the local ice-flow directions, and probably mark the positions of temporary halts in the recession of an active ice-margin (Gadd, 1973). These ridges serve to block the drainage of the area, resulting in the formation of many bogs and lakes, including Magaguadavic and Oromocto Lakes (Chalmers, 1884, 1902).

A significant halt, referred to as the Oromocto-Gagetown Phase by Gadd (1973), appears to have occurred during this recession. The large ice-contact fan deposit in the Magaguadavic valley, southeast of Thomaston Corner, probably marks the position of this ice-margin. To the northeast, the ice may have abutted the fault scarp marking the contact between the Silurian sedimentary rocks and the Mississippian rhyolite (See Fig. 2). Meanwhile, to the west the ice-margin appears to have been less stationary, apparently retreating slowly northeastward, forming the sequence of morainic ridges and esker fans in the McAdam area at temporary ice-marginal positions. Gadd (1973) feels that a lobe of ice occupied the Oromocto Lake basin at this time, forming the morainic deposits at the southern end of the lake.

During this period of time, the outwash deposits in the Magaguadavic River valley were formed (Gadd, 1973). These deposits appear to lie at three levels. The upper two levels contain occasional kettle holes, formed by the melting out of buried ice blocks, and indicating deposition close to an ice-margin. These outwash deposits buried pre-existing ice-contact deposits, as shown by the partially buried esker at Brockway (which was apparently partially exhumed during a later outwash stage).

The upper level outwash probably correlates with deposition of the large ice-contact fan, while the intermediate level may correlate with the outwash along Deadwater Brook and the Northeast Branch Magaguadavic River, deposited during recession from the Oromocto-Gagetown position. The lowest level probably relates to the latest stage of outwash deposition, possibly correlating with Gadd's (1973) Canterbury-Marysville Phase.

Mathew (1879) felt that this lowest level outwash comprised material deposited in estuarine waters relating to the maximum level of marine submergence. Chalmers (1884), on the other hand, appears to correlate it with a lake backed up by a morainic dam downstream. Neither hypothesis seems likely, since no morainic dam appears evident, nor is reported by Gadd (1973), marine waters do not appear to have extended above the 60 to 70 m level in the area to the south (Thibault, 1982), and the scarp contact between this level and the higher ones is irregular, and appears to be more likely due to fluvial erosion than to shoreline erosion.

Post-glacial history

Subsequent to deglaciation of the area, the newly exposed glacial deposits were subjected to physical and chemical weathering, and the initiation of soil development, which continues to this day (see Wicklund & Langmaid, 1953). As noted by Rampton & Paradis (1981) for the area to the north, the numerous depressions and generally poor drainage resulted in the development of bogs. Normal alluvial activity commenced in the drift-filled portion of the Magaguadavic valley, with the underfit, meandering Magaguadavic River forming a relatively narrow alluvial plain by erosion of the outwash deposits.

GRANULAR AGGREGATE DEPOSITS

Description of map units and major aggregate sources

The granular aggregate resources of the McAdam/Forest City area are found in three basic types of deposits. These deposits are: 1) ablation till, 2) ice-contact stratified drift, and 3) glaciofluvial outwash.

The quality characteristics are generally similar within deposits of a given type. Consequently, a description of each deposit type is given below, as well as a discussion of the more important deposits. Detailed information on individual deposits can be found in Appendices A and B.

1) Ablation till:

Ablation till comprises that material which, having been carried into the terminal zone of a melting glacier by transport within or upon the ice, is deposited onto the ground by sliding, flowing, or subsidence (Flint, 1971). "The resulting till is therefore loose, noncompact, and nonfissile, and its clasts are less strongly abraded than those in lodgement till" (Flint, 1971, p. 171). Ablation till deposits may take on a variety of topographic forms, with surfaces ranging from flat through hummocky to ridged. Such deposits may range in size from small, isolated occurrences surrounded by lodgement till or bedrock, to extensive areas covering many square kilometres.

Typically, ablation till exhibits very poor sorting, generally containing the entire grain size range from clay through to boulders. Frequently, excessive quantities of both boulders, and silt and clay are present, limiting the potential of the material in the pit-run state. With selective removal of the boulders (which could be used for rip-rap), ablation till will generally be suitable for use as fill. When only low-specification aggregate is required, it would constitute good resource management policy to utilize ablation till, when economically feasible, so as to conserve the material in superior quality deposits for higher-specification usage. If necessary, the quality of ablation till can be improved by crushing and washing. However, this increases the cost of exploitation considerably.

Ablation till deposits are widely distributed throughout the McAdam/Forest City area, primarily in many of the valleys and other low-lying areas. However, only those areas which appeared to have either significant thicknesses of workable material, or lesser thicknesses of material coupled with a very high boulder content, are outlined on the map. The latter areas (to the west of Cranberry Ridge, and at the south end of Oromocto Lake) have potential as source areas for rip-rap. Many smaller, unmapped areas, particularly within the granitic terrain, may also have similar potential.

Many small pits have been developed in ablation till deposits throughout the study area, primarily to provide material for logging road construction. The locations of these pits indicate the occurrence of smaller, unmapped areas of ablation till which may have local potential. The distribution of morainic ridges, many of which consist, at least in part, of ablation till, can also be used to indicate potential local sources of this low-grade material.

2) Ice-contact stratified drift:

Ice-contact stratified drift deposits comprise those formed when meltwater, flowing on, within, or against a glacier, deposits sediment in contact with the ice. In the McAdam/Forest City area, eskers and associated esker fans are the only significant ice-contact features. Eskers are long, frequently sinuous ridges, formed by streams flowing in channels or tunnels within a melting glacier (Flint, 1971). Esker fans are fan-like deposits formed where the meltwater streams spread out and deposited much of their load upon exiting from the confining walls of the glacier.

In general, ice-contact stratified drift deposits consist primarily of sand and gravel, with variable quantities of clay, silt, cobbles and boulders. The sorting can vary from good to very poor, while the texture frequently exhibits abrupt lateral and vertical variations. Due to their deposition in contact with glacial ice, such deposits frequently exhibit post-depositional deformation structures due to slumping as the supporting ice melts away. Because of their intimate association with the glacier, pockets of ablation or lodgement till may be present.

The bulk of the reserves of ice-contact origin occur in deposits formed in drainage systems tributary to the Magaguadavic River valley. The easternmost such deposit is a large esker which lies along Deadwater Brook. This deposit is estimated to contain 3 million m^3 of material (see G11-20). While there are no exposures in this deposit within the map-area, information from the area to the north indicates that the material is probably of good, and possibly excellent, quality.

A second esker system runs eastward along Cranberry Brook, traverses the southern end of Magaguadavic Lake (its subaqueous trace is visible on the aerial photographs), heads southward at Magaguadavic Siding (where it increases immensely in size), and then (again reduced in size) runs southeastward along Davis Brook. The esker along Cranberry Brook has estimated reserves in excess of 240,000 m^3 (G11-11). The material appears to be of fair to good quality. The deposit at Magaguadavic Siding has estimated reserves of 3 million m^3 (G11-17, 18). While about two-thirds of the material here appears to consist of sand, the coarse aggregate present appears to be of good to excellent quality. The esker along Davis Brook has estimated reserves of 230,000 m^3 (G11-19). This material also appears to be of good, and possibly excellent, quality. A small esker along Duck Brook (20,000 m^3; see G11-11), and an ice-contact complex at Farm Point (240,000 m^3, predominantly fine; G11-16), are probably related to this major system.

At the point of convergence of the Davis Brook esker, and the gorges (probably formed by subglacial meltwater flow) of the main Magaguadavic River and the Northeast Branch Magaguadavic River (the latter related to the eastern esker), a large ice-contact fan is present. This deposit has been heavily worked, but is still estimated to contain reserves on the order of 2.4 million m^3 (G11-22). The material is of fair to good quality. Nearby esker-like deposits (G11-23) may be related, or may correlate with the Davis Brook esker. These deposits are estimated to have reserves of fair to good material in the order of 470,000 m^3.

A third, discontinuous drainage system lies to the west.

It enters the McAdam area along Palfrey Stream (see G11-1), forms a complex deposit at Sixth Lake, and is represented by esker segments along Dead, North, and White Beaver Brooks and where Lower Trout Brook enters the Magaguadavic River valley. The esker continues down the Magaguadavic River, exiting the study area. As can be expected from a system of such length, it exhibits considerable variability. An estimated 830,000 m^3 of material are associated with the ice-contact complex at Sixth Lake (G11-2, 3, 4). Much of the material here appears to be sand; however, the coarse material present appears to be of good to excellent quality. The esker ridge deposits along Dead (40,000 m^3; G11-7), North (20,000 m^3; see G11-7), and White Beaver (185,000 m^3; see G11-12, 13, 14) Brooks appear to consist largely of sand. However, gravel may be locally present. Esker fans along the White Beaver Brook portion contain fair to good, and possibly excellent, coarse aggregate (30,000 m^3; G11-12: 300,000 m^3; G11-14). The esker deposits along Lower Trout Brook and the Magaguadavic River contain estimated reserves of 970,000 m^3 (G11-28, 29, 31). This material is of generally fair to good quality.

Significant ice-contact deposits are also associated with the St. Croix drainage system. A small esker at the head of Palfrey Lake has estimated reserves of 80,000 m^3 (G11-5). A major esker system runs along the St. Croix River, in the southern part of the McAdam area. Much of this deposit lies within Maine. However, in excess of 1 million m^3 of fair to good quality aggregate are estimated to be present in the Canadian portion (G11-8, 9).

A small esker is present at the north end of Oromocto Lake

(G11-32). This deposit contains an estimated 240,000 m^3 of fair to good quality material. Two small eskers are also present in the Forest City area (G12-2,5). They contain estimated reserves of 60,000 m^3 and 90,000 m^3, respectively. Most of the material appears to be fine. Coarse material is present in an esker fan at Red Bank, on Grand Lake (G12-1). An estimated 20,000 m^3 of fair to good quality material are present here.

3) Glaciofluvial outwash:

Glaciofluvial outwash consists of that material which is deposited beyond the margins of a glacier by the action of melt-water streams. In general, this material consists of well-washed, horizontally stratified sand, gravel, or combinations thereof. As is typical of all fluvial deposits, clast roundness increases, and average particle size decreases, in the downstream direction (Flint, 1971).

More than half of the calculated reserves of granular aggregate in the McAdam/Forest City area are found in the outwash deposits along the Magaguadavic River system. In excess of 1.2 million m^3 of good quality, generally coarse aggregate is contained in deposits along Deadwater Brook and the Northeast Branch Magaguadavic River (G11-20,21), while the lower Magaguadavic River valley is estimated to contain reserves in excess of 25 million m^3 (see G11-24, 25, 26, 27, 30, 31). This material exhibits a marked downstream fining trend. North of Upper Brockway, the material appears to consist predominately of sand and gravel or sandy gravel (see G11-24,25). This material is of fair to good quality. To the south, most of the material appears to consist of sand and gravelly sand, though gravel is locally present (eg. G11-27).

These outwash deposits may locally contain buried ice-contact material. This is definitely the case at Brockway (see G11-29,30), and may explain the parallelism of many of the small tributary streams to the Magaguadavic River, since the ice-contact material would probably be texturally similar to the material at G11-22, G11-23, and G11-29, and thus less easily erodible than the finer outwash material.

It should be noted that, while the reserve volume is large, the outwash material is spread over an extensive area. Consequently, the workable thickness is frequently small, which limits the workable potential of the deposit. Where the deposit is thin, the area would probably not be suitable for large-scale extraction operations. The most suitable sites for such operations would appear to be the area north of Pratts Brook on the east side of the Magaguadavic River, and in the high and intermediate level material between Brockway and Upper Brockway, on the west side of the river.

Quality parameters

The suitability of a granular aggregate deposit for various uses is determined by two primary physical parameters: 1) the grain size characteristics of the material, and 2) the lithologic characteristics of the component clasts.

1) Grain size characteristics:

The grain size characteristics of an aggregate are determined by passing a sample of the material through a nest of sieves

(A.S.T.M. C136-76), and apply specifically to the sample examined. These characteristics can also be estimated in the field, on a qualitative basis. In this report, the grain size classification scheme outlined in Table I is utilized.

The relative proportions of the different major grain size classes within a deposit, or a unit of a deposit, define the texture of the material. The terms used for textural classification in this report are shown in Table II, along with their approximate quantitative meaning.

There are four textural factors which may impose limitations on the potential of a granular aggregate deposit, with respect to different usages. These factors are: a) fine particle content, b) coarse particle content, c) grading, and d) variability.

a) Fine particle content. A content of fine particulate matter (that material passing through a 75 μm sieve) in excess of 5% in an aggregate is generally considered deleterious, and for some usages, even lower percentages are specified (Bates, 1969). For example, D.O.T. (1980) specifications impose a limit of 3% on material to be used for fine concrete aggregate, and 1% for material to be used for coarse concrete aggregate. Aggregate which contains fines in excess of specified limits may be improved to acceptable levels by washing. However, such processing significantly increases the cost of exploitation. The fine material content of a sample is most accurately determined by means of the wet sieving process (A.S.T.M. C117-76).

In the McAdam/Forest City area, all three deposit types may exhibit high contents of fine particulate matter. In ablation till deposits a high fines content appears to be ubiquitous,

TABLE I

Grain Size Classification

Descriptive Size Category	Sieve Size	
	Passing	Not Passing
Boulders	-	300 mm
Cobbles	300 mm	100 mm
Gravel - coarse	100 mm	50 mm
- medium	50 mm	19 mm
- fine	19 mm	4.75 mm
Sand - coarse	4.75 mm	1.40 mm
- medium	1.40 mm	300 µm
- fine	300 µm	75 µm
Silt and clay (fines)	75 µm	-

TABLE II

Textual Classification

	% passing 4.75 mm (approximate range)
Gravel	0 - 20
Sandy Gravel	20 - 40
Sand and Gravel	40 - 70
Gravelly Sand	70 - 95
Sand	95 - 100

	% passing 75 µm (approximate)
Silty	>10
Slightly Silty	5 - 10

while in ice-contact stratified drift deposits it occurs only locally (as a function of their pronounced textural variability), and in outwash deposits only rarely (usually in the finer grained, distal portions).

b) Coarse particle content. While an abundance of cobble and boulder size clasts in a deposit will not affect the quality of the material, it will impose operational problems. It will require extra effort to selectively remove such material, thus increasing operational costs (Cooper, 1980; Lenhart, 1962). However, if the material is to be crushed, the presence of good quality cobbles and small boulders of crushable size may actually improve the quality of the material. Large boulders, if present in sufficient numbers, could be exploited for use as rip-rap.

In the McAdam/Forest City area, coarse particle contents are quite high in most of the ablation till deposits. Some of the ice-contact deposits also contain excess coarse material. However, this does not appear to have imposed sufficient restriction so as to inhibit operation.

c) Grading. Grading refers to the particle size distribution within the aggregate (i.e the relative proportions of material in the different size categories). The natural grading of a deposit may be improved by crushing or by selective screening and recombination. However, such processing increases production costs.

Grading limits are specified by users (eg. D.O.T.), and will vary, depending upon the use to which the material will be put. As an example, Table III indicates the grading limits

TABLE III

Grading Limits For Fine Concrete Aggregate

Sieve Size	Total % passing (by weight)
9.5 mm	100
4.75 mm	95 - 100
2.36 mm	80 - 100
1.18 mm	50 - 85
600 µm	25 - 60
300 µm	10 - 30
150 µm	2 - 10
75 µm	<3

(derived from D.O.T., 1980)

specified by the Department of Transportation for fine concrete aggregate. Poor grading may restrict the potential of some deposits for some uses. For example, an analysis of the sand fractions of all of the samples collected from the McAdam/ Forest City area indicates that only about 10% would meet the requirements for fine concrete aggregate in the pit-run state.

d) Variability. As noted by Cooper (1980), the variability of a deposit affects "the ability of an operation to maintain a consistent quality of product ..., and the costs of working a variable deposit in order to maintain product quality" (p. 18). In the McAdam/Forest City area, variability is only a significant factor in the ice-contact stratified drift deposits.

2) Lithologic characteristics:

The composition of the component clasts within an aggregate deposit has a significant effect on the quality of the material (Cooper, 1980). Preferably, clasts should exhibit three primary characteristics: a) they should be of good physical quality, b) they should be uncoated, and c) they should not react with any cementing materials. These characteristics are discussed below.

a) Physical quality. Ideally, clasts should be hard, strong, and durable. Soft materials such as shale, schist, and friable sandstones are unsuited for use in most aggregates, since they disintegrate easily, while porous or fractured rock fragments may split due to the expansion of water as it freezes (Bates, 1969).

The lithologic analyses reported in the appendices divide the clasts into two groups, sound and unsound. The two groups are differentiated primarily on the basis of the resistance of the clasts to disintegration under mechanical impact (with the exception of chert, which exhibits chemical instability in concrete). The results of this test should not be confused with those from quantitative soundness tests, such as the magnesium sulphate test, nor with abrasion tests, such as the Los Angeles abrasion loss test used by the Department of Transportation (the results of which are recorded in the appendices, when available).

b) Clast coatings. The presence of silt, clay, carbonate, or oxide coatings on clasts renders them unsuitable for use in high-specification aggregate, since they weaken the bond between the clast and the cementing agent, and in concrete may become chemically unstable (Bates, 1969). Silt and clay coatings may be removed by washing, with consequent increase in cost of exploitation. Removal of chemical coatings would require more complicated procedures, and would be prohibitively expensive.

In the McAdam/Forest City area, silt/clay coatings on clasts in outwash and ice-contact deposits are generally light to moderate (occasionally nil). However, in local areas or horizons of ice-contact deposits, and throughout ablation till deposits, the clasts exhibit moderate to heavy silt/clay coatings.

Light to moderate manganese oxide coatings occur on many of the sedimentary rock clasts. In deposits which contain a high proportion of such clasts, the presence of this coating may impose a restriction on the use of the material for high specification aggregate.

c) Alkali-reactivity. Clasts which consist of opaline or cryptocrystalline silica react with the alkalis in cement. As a result of this reaction, the clasts expand, causing cracking of the concrete, and making it susceptible to freeze-thaw and other destructive processes. The primary offenders are chert, and some felsic extrusives (Bates, 1969).

Chert does not appear to be overly abundant in the study area, being present in slightly more than half of the samples tested (generally 1 to 2%; maximum 3%). Felsic extrusive clasts are somewhat more common, being present in approximately three-quaters of the samples (generally 1 to 2%; maximum 7%). It is not known whether these felsic extrusives are reactive. However, it would be safest to assume that they are, until proven otherwise.

In cases of suspected reactivity, the use of low-alkali portland cement, or the partial substitution of a pozzolanic material, such as fly-ash or finely ground silieous material, for some of the cement is recommended (Bates, 1969; Lenhart, 1962).

CONCLUSIONS

Workable reserves of granular aggregate material in the McAdam map-area are estimated to be in excess of 40 million m^3. Reserves of such material in the Forest City map-area are estimated at approximately 170,000 m^3. For the purpose of this study, the above quantities refer to that material which appears to be physically extractable. However, they do not entirely take into account the sterilizing effects of various cultural, economic, or physical restrictions, which may limit or even restrict access to these reserves.

Approximately half of the total reserves of aggregate in the study area are contained in fine deposits with little, or no, gravel potential. However, much of the gravel present is of fair to good quality, while local areas appear to contain excellent material, with potential for use in the production of concrete aggregate.

Not included in these reserve estimates are the extensive quantities of poor quality material located in ablation till deposits. However, these deposits can constitute significant local sources for fill, particularly for logging road construction.

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APPENDIX A

SAMPLE DESCRIPTIONS

OF

McADAM MAP-AREA

21 G/11

LOCATION #:	G11-1	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Canterbury
Status:	Active on demand	UTM:	183 671

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on underlying material; silty.

1.5 m Sand and Gravel: Crudely stratified medium to coarse sand and fine to coarse gravel, with occasional cobbles; occasional layers of pebbly sand, and openwork gravel, are present, primarily towards the base of the unit; maximum clast size is 0.3 m; clasts are subrounded with light to moderate silt coatings; sample A was obtained from this unit.

0.7 m Sand: Faintly stratified, clean, well sorted medium sand; sample B was obtained from this unit.

1.7 m Slump Covered: Assumed to be sand, possibly with some gravel.

This deposit lies mainly within the Canterbury (21 G/14) map-area. Much of that portion of the deposit in the McAdam area is depleted, with only limited amounts of material remaining.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		81.8	76.6	62.8	49.4	32.6	18.2	6.0	3.1	2.2	1.4
B		----	----	100.0	99.9	99.2	94.0	23.0	3.1	1.7	0.9
C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 27%	Sound Lithotypes 73%
felsic intrusive 18; weathered 6; sandstone 2; siltstone 1	felsic intrusive 46; metasedimentary 12; sandstone 6; quartzite 4; felsic extrusive 1; mafic extrusive 1; greywacke 1; argillite 1; metavolcanic 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
			limited

LOCATION #:	G11-2	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker fan)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Active on demand	UTM:	200 652

SECTION DESCRIPTION & COMMENTS:

East face, south end

0.4 m Overburden: Soil development on the underlying material; slightly silty.

1.8 m Sand, and Sand and Gravel: Interbedded layers of fine to medium sand, and of medium to coarse sand and fine to medium gravel; individual layers are generally 5-15 cm thick; the upper half of this unit exhibits horizontal bedding, while in the lower half the beds are dipping towards the southwest; sample A is from this location.

3.6 m Slump Covered: Sand and/or gravel.

East face, centre

0.3 m Overburden: As above.

1.7 m Sandy Gravel: Crudely stratified, cobbly, medium to coarse gravel, with a matrix of medium to coarse sand; contains occasional lenses of medium sand (0.1-0.4 m maximum thickness); clasts are predominantly subrounded, with light to moderate silt coatings; many of the clasts of sedimentary origin exhibit light manganese oxide coatings; sample B is from this location.

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		94.7	91.8	82.8	73.4	56.9	42.2	18.9	8.6	3.8	1.8
	B	88.2	48.1	44.2	37.6	32.5	27.5	23.0	10.7	3.7	2.2	1.5
	C		99.4	99.2	94.7	89.0	82.5	70.6	42.0	9.2	1.9	0.8

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 12%	Sound Lithotypes 88 %
felsic intrusive 5; sandstone 4; weathered 2; schist 1	felsic intrusive 55; quartzite 8; sandstone 7; metasedimentary 7; mafic extrusive 4; greywacke 4; gneiss 2; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m³) probable
9	7	4	280,000

LOCATION #: G11-2 (cont'd)

3.5 m Slump Covered: On a subsequent visit to this site, it was being operated by D.O.T., using a backhoe. Most of the slump material had been removed from the vicinity of this section. This new exposure indicates that the material becomes finer with depth, comprising predominantly medium sand, with minor layers of gravelly sand or sand and gravel, and occasional boulders. Sample C was taken from this exposure.

Many large boulders (up to approximately 4 m in size) are present on the pit floor and in the pit faces. Most of those on the pit floor have been moved into waste piles.

D.O.T. (1976) test data is summarized below:

Sieve Analyses (10 samples):
between 34% and 77% passing 4.75mm (52% average)
between 2.3% and 5.8% passing 75μm (3.7% average)

Los Angeles Abrasion Loss (from 10 samples):
32.6% to 35.7%

Recommended for use as borrow, subbase and base course aggregate. Also noted as meeting the physical requirements for asphaltic concrete.

Based on this D.O.T. data, and on the mechanical and lithological analyses, it appears that this deposit may have potential as a source of both fine and coarse concrete aggregate.

This deposit comprises the westernmost portion of an ice-contact complex. It appears to have formed where two separate subglacial streams, flowing along either side of Cranberry Ridge, joined together into one. The eastern stream is represented by a well-defined esker, (G11-3). The western one is represented by a very small, largely depleted, ice-contact deposit (UTM 194 659), which appears to connect, via a drainage channel, with the esker at G11-1. The reserve calculations presented here apply only to the western portion of the ice-contact complex.

An area of ablation till has been mapped to the west of Cranberry Ridge. This material has little sand and gravel potential, since the water table is quite shallow. However, it is extremely bouldery, and could thus have potential as a source for rip-rap.

LOCATION #:	G11-3	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Abandoned	UTM:	211 654

SECTION DESCRIPTION & COMMENTS:

Composite section (maximum section height is 4.5 m).

0.4 m Overburden: Soil development on the underlying material.

0.0-0.6 m Sandy Gravel: Fine to coarse gravel, with occasional cobbles, and a matrix of medium to coarse sand; clasts are subrounded, with light to moderate silt coatings; this unit may be lightly oxidized, and appears massive; it appears to occur at the top of about 75% of the deposit; sample A was obtained from this unit.

0.2-1.0 m Sand: Clean, well sorted medium sand; unit appears massive; sample B was obtained from this unit.

up to 3.0 m Slump Covered: Assumed to be sand; half a dozen large boulders, up to 2.5 m in size, are exposed at this level.

The esker ridge extending to the west has been tested in detail by D.O.T. (1976). This data indicates that the material is quite variable along the deposit, ranging from fine gravelly fine to coarse sand through to sandy, cobbly, fine to coarse gravel, but with most of the material being between these

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	47.3	41.3	32.5	27.7	22.4	15.5	4.8	2.3	1.7	1.3
	B	----	----	100.0	99.8	99.6	96.5	42.2	4.0	1.5	0.9
	C										

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 16%	Sound Lithotypes 84%
felsic intrusive 8; weathered 6; sandstone 1; metasedimentary 1	felsic intrusive 51; quartzite 12; sandstone 8; metasedimentary 6; felsic extrusive 2; mafic extrusive 2; siltstone 1; argillite 1; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
5	5	3	150,000

LOCATION #: G11-3 **(cont'd)**

extremes. This D.O.T. (1976) data is summarized below:

Sieve Analyses - gravelly sand (6 samples):
between 70% and 86% passing 4.75mm (76% average)
between 1.4% and 2.4% passing 75μm (1.8% average)

- sand and gravel; sandy gravel (5 samples):
between 34% and 63% passing 4.75mm (52% average)
between 1.6% and 4.3% passing 75μm (2.4% average)

Los Angeles Abrasion Loss (from 11 samples):
33.6% to 36.3%

Recommended for use an borrow, subbase, and base coarse aggregate, except for the sandy sections, which are recommended only for borrow.

The pit located approximately 700 m to the southwest (UTM 206 650) also exposes a maximum section (at the crest) of 4.5 m. Medium to coarse sand, and sand and gravel are exposed at the crest, and fine to medium sand on the flanks. A few cobbles were observed. The esker is approximately 40 m wide at this point.

This esker comprises part of an ice-contact complex (see G11-2). Reserve estimates apply only to that material contained within the esker.

LOCATION #:	G11-4	NTS:	21 G/11
Type of Deposit:	Ice-contact(?) (kame delta?)	County:	York
Exposure Type:	Roadcut	Parish:	McAdam
Status:	Undeveloped	UTM:	208 647

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material; slightly silty.

1.2 m Sand and Gravel: Predominantly coarse sand and fine to coarse gravel, with occasional cobbles; maximum clast size is 0.3 m; clasts are subrounded, with moderate silt coatings; no stratification is evident.

1.5 m Slump Covered: Assumed to be material as above.

A cut approximately 150 m to the north of this site and approximately 5 m deep exposes material similar to that described above. The surface of the deposit is gently rolling, with relief in the order of 1 m. A couple of boggy depressions are present towards the northern edge of the deposit.

Lack of exposure precludes positive identification of the mode of origin of this deposit. However, it has been interpreted as a kame delta, based on the following evidence: 1) its southern and eastern margins are defined by an abrupt downward slope, 2) it lies adjacent to a lake basin, and 3) its proximity

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		85.7	85.1	77.5	64.3	41.0	20.1	4.2	2.5	1.7	1.0
	b	(partial)				100.0	63.8	31.2	6.5	3.8	2.7	1.6
	c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 27%	Sound Lithotypes 73%
felsic intrusive 12; weathered 6; sandstone 3; siltstone 2; mafic extrusive 1; chert 1; metasedimentary 1; slate 1	felsic intrusive 36; metasedimentary 17; sandstone 11; greywacke 3; argillite 2; quartzite 2; felsic extrusive 1; mafic extrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
25	20	2	400,000

LOCATION #: G11-4 (cont'd)

to an esker complex and the occurrence of a number of large boulders at its northwestern end probably indicate formation in an ice-marginal environment. If this interpretation is correct, much of the material may be similar to that at the described section. This may be supported by the fact that an 0.5 m hand dug test hole near the western edge of this deposit exposed sand and gravel.

This deposit comprises part of an ice-contact complex. However, its form and location indicate that it was formed subsequent to the formation of the northern (G11-3) and western (G11-2) portions. Reserve estimates apply only to this southeastern portion of the complex.

LOCATION #:	G11-5	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Canterbury
Status:	Active on demand	UTM:	168 616

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material.

0.5 m Gravelly Sand: Poorly sorted, fine to coarse sand with abundant pebbles.

0.6 m Sand: Apparently massive fine sand grading downwards into horizontally stratified, fine to coarse sand.

1.4 m Sand and Gravel: Cross-stratified medium to coarse sand and predominantly fine to medium gravel, with occasional cobbles; clasts are predominantly subrounded, with nil to light silt coatings and minor manganese oxide coatings; palaeoflow direction is towards the southeast; sample A was obtained from this unit.

1.0 m Sand: Cross-bedded medium to coarse sand, with minor small pebbles; sample B was obtained from this unit.

1.0 m Slump Covered: Assumed to be sand as above.

This pit is one of a series in this deposit, the others being inactive. These pits consist of similar material, with an approximately 5 m average section

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		66.9	63.4	54.9	45.7	29.8	15.4	2.9	1.2	0.8	0.5
B		98.6	98.6	98.2	96.5	87.9	56.7	11.4	3.5	1.4	0.7
c	(partial B)				100.0	91.0	58.8	11.8	3.6	1.4	0.7

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 30 %	Sound Lithotypes 70 %
felsic intrusive 18; weathered 5; sandstone 3; chert 2; mafic extrusive 1; shale 1	felsic intrusive 32; sandstone 17; quartzite 6; mafic extrusive 5; metasedimentary 5; argillite 2; felsic extrusive 1; siltstone 1; greywacke 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
5	2	4	80,000

LOCATION #: G11-5 **(cont'd)**

height (~7 m maximum). Occasional large granitic erratics, up to 2 m in size, are present.

D.O.T. (1975) test data gives the following results:

Sieve Analyses - sand and gravel (1 sample):
50% passing 4.75mm, 1.4% passing 75µm

- gravelly sand (8 samples):

between 70% and 93% passing 4.75mm (80% average)
between 0.8% and 1.4% passing 75µm (1.2% average)

Los Angeles Abrasion Loss (from 9 samples):
35.6% to 38.7%

Recommended for use as borrow, and as a possible source of filter material.

Much of the northern portion of this deposit has been depleted. Two small pits to the west (UTM 165 618) and northwest (UTM 160 628) in the Forest City map-area expose 1.5 to 2.0 m (maximum) of sand, and sand and gravel, in very small esker segments. These segments may correlate with the above deposit. The northern deposit is largely depleted, but limited reserves remain at the western one.

These ice-contact deposits lie within a large area of ablation till along Palfrey and La Coote Streams. Similar deposits may also be present elsewhere within this area. However, their small size precludes identification from aerial photographs. The ablation till itself is hummocky and locally ridged, and may have potential as a source of fill. It is also frequently bouldery, and could thus constitute a good source of rip-rap.

LOCATION #:	G11-6	NTS:	21 G/11
Type of Deposit:	Ablation till	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Active on demand	UTM:	196 590

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; very iron rich.

1.1 m Sand and Gravel: Moderately dense, horizontally stratified, poorly sorted medium to coarse sand and fine to coarse gravel, with occasional cobbles and boulders; maximum clast size is 1 m; clasts are subangular to subrounded, with moderate to heavy silt coatings.

0.3 m Sand: Moderately dense, alternating beds of silty fine sand and slightly pebbly fine to coarse sand.

0.2 m Sand and Gravel: As above.

0.5 m Slump Covered: Assumed to be sand and gravel; pit base is at the water table.

The maximum exposure in this material is 3 m. The adjacent pit to the west contains boulders up to 2 m in size. Both of these pits were operated at various times throughout the summer of 1981 by Georgia-Pacific.

This material is representative of much of the ablation till within the McAdam area, though in general it is usually more bouldery.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing a		78.5	74.5	65.7	56.3	46.5	37.9	24.0	13.6	7.7	4.1
b											
c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 23%	Sound Lithotypes 77%
weathered 9; felsic intrusive 5; sandstone 4; metasediments 3; mafic extrusive 1; shale 1	felsic intrusive 36; sandstone 11; metasedimentary 9; quartzite 7; mafic extrusive 4; greywacke 3; argillite 3; quartz 2; felsic extrusive 1; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
			moderate quantities of low-grade material

LOCATION #:	G11-7	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	201 585

SECTION DESCRIPTION & COMMENTS:

Upper lift

0.5 m Overburden: Soil development on gritty fine sand; somewhat silty.

0.5 m Gravelly Sand: Medium to coarse sand with frequent small pebbles; pebbles become smaller and less abundant with depth; unit appears massive.

0.3 m Sand: Fine to medium sand, with minor grit; no stratification is visible.

Lower lift

1.2 m Sand: Alternating beds, on the order of 1-10 cm thick, of fine sand and medium sand; some layers are slightly silty.

0.7 m Sand and Gravel: Horizontally stratified medium to coarse sand and fine to medium gravel; clasts are subrounded.

1.6 m Sand: Trough cross-stratified medium sand, with minor coarse sand and silty lenses.

1.6 m Slump Covered: Assumed to be material as above; probably sand.

The maximum clast size in the pit area is 0.3 m. The sample was derived from all three units exposed in the lower lift.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		98.4	97.7	95.0	90.1	83.3	76.0	42.8	17.0	6.0	2.2
	b	(partial)				100.0	92.5	84.4	47.5	18.9	6.7	2.4
	c											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
A	4	2	2	40,000
B	1	1	2	20,000

LOCATION #: G11-7 (cont'd)

That portion of the esker lying to the west of Dead Brook is largely depleted. Minor quantities of sandy, cobbly gravel remain in the pit extending along the logging road (UTM 197 589). The two pits in the esker segment to the west (UTM's 195 588 and 196 587) contain limited quantities of predominantly fine material, though the northern one contains a minor amount of cobbly gravel.

Reserve estimate A pertains to this esker deposit. Based on the above observations, it appears that the bulk of these reserves will probably consist of fine material.

A continuation of this esker appears to be present to the southeast, along North Brook. Reserve estimates (B) are presented for the northern segment. The southern segment lies in a boggy area, and appears to be quite low. Consequently its reserve potential appears to be limited. These esker segments lie within a small area of hummocky ablation till (not mapped) which may have some potential as a source of low grade material.

LOCATION #:	G11-8	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	223 436

SECTION DESCRIPTION & COMMENTS:

Crest

0.4 m Overburden: Soil development on the underlying material; slightly silty.

1.6 m Sand and Gravel: Crudely stratified medium to coarse sand and predominantly fine to medium gravel, with occasional cobbles; the material appears to fine slightly with depth; maximum clast size is 0.3 m; clasts are subrounded, with light to moderate silt coatings, and a moderate level of manganese oxide coatings; sample A is from this unit.

4.5 m Slump Covered: Assumed to be sand and gravel (the southwest flank of the deposit has been partially scraped, exposing predominantly sand and gravel).

Northeast flank

0.4 m Overburden: Removed; estimated thickness.

2.6 m Sand: Stratified fine sand (2.4 m) overlying stratified fine to coarse sand; the upper 0.7 m is lightly oxidized; sample B is from this unit.

2.8 m Slump Covered: A cobble layer is present at the base of the above unit; the material below this is probably sand and gravel correlative with that at the crest.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		73.8	70.2	58.8	44.7	29.2	17.4	4.3	1.7	1.1	0.7
	B				100.0	99.6	97.2	93.1	88.0	63.8	20.8	4.8
	C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 23%	Sound Lithotypes 77%
sandstone 7; weathered 5; shale 4; felsic intrusive 2; metasedimentary 2; schist 2; manganiferous sandstone 1	felsic intrusive 21; sandstone 19; metasedimentary 12; greywacke 11; mafic extrusive 5; felsic extrusive 2; mafic intrusive 2; siltstone 2; quartzite 2; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
10	7	4	280,000

LOCATION #: G11-8 **(cont'd)**

This pit is developed on the west flank of a broad esker ridge. Two other pits (abandoned) are present in this deposit. The first of these (UTM 224 435), on the east side of the ridge, is approximately 6 m deep and exposes sand with minor gravel. The sand is variable from fine to coarse. The second pit (UTM 225 433) is in the southern tail of the deposit, with a maximum face height of approximately 3 m (approximately 1 m on the flanks). Slightly cobbly sand and gravel forms the core of the ridge at this location, with sand predominant along the flanks. Bedrock is exposed at the base of the pit near its southern end. The southern portion of the deposit is largely depleted.

Based on the above evidence, and on the information from G11-9 (in a continuation of this esker to the south), most of this deposit probably consists of sand and gravel, with the sand unit being confined primarily to the flanks of the esker.

LOCATION #:	G11-9	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	235 414

SECTION DESCRIPTION & COMMENTS:

Upper lift

0.3 m Overburden: Soil development on the underlying material; silty.

0.5 m Sand and Gravel: Apparently massive medium to coarse sand and fine to medium gravel, with occasional cobbles and boulders.

1.0 m Gravelly Sand: Stratified, predominantly medium sand with frequent small pebbles.

0.5 m Sand and Gravel: Apparently massive medium to coarse sand and fine to medium gravel, with minor cobbles.

4.0 m Slump Covered: Assumed to be material as above.

Sample A was derived from all of the above units.

Lower lift

0.2 m Sand and Gravel: Disturbed material, forming the floor of the upper lift.

1.0 m Sandy Gravel: Medium to coarse cobbly gravel, with a medium to coarse sand matrix; no stratification is evident; sample B was obtained from this unit.

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		85.8	81.8	73.5	65.7	54.7	39.6	6.9	2.4	1.6	0.9
	B	72.8	42.7	39.9	35.7	32.4	25.4	15.0	2.9	0.9	0.4	0.2
	C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 26%	Sound Lithotypes 74%
felsic intrusive 8; sandstone 5; weathered 5; schist 4; shale 2; chert 1; metasedimentary 1	sandstone 22; felsic intrusive 11; greywacke 11; metasedimentary 10; quartzite 8; mafic extrusive 6; argillite 3; quartz 2; metavolcanic 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
20	20	4	800,000

LOCATION #: G11-9 (cont'd)

0.4 m Sandy Gravel: As above, but with a relatively high silt content.

1.2 m Slump Covered: Assumed to be material as above.

Maximum clast size in the pit area is 0.9 m, with only a half dozen or so large boulders being present. Clasts are predominantly subrounded, with light to moderate silt coatings, and minor manganese oxide coatings.

In the pit area, the main crest of the esker is about 40 m wide. Approximately 400 m to the south, the esker branches into two ridges. Further south, below Trout Brook, the esker is present as a single very small ridge, with little or no aggregate potential.

Limited exposures in the main deposit, and exposures in pits just to the south of the map boundary, indicate that sand may be locally predominant over gravel.

LOCATION #:	G11-10	NTS:	21 G/11
Type of Deposit:	Ice-contact (kame delta?)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	301 485

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material.

1.7 m Gravelly Sand: Cross-stratified medium to coarse sand with predominantly fine gravel; palaeoflow direction approximately southeast; sample A was obtained from this unit.

1.0 m Sand: Ripple laminated silty fine sand grading downwards into clean fine sand; sample B was obtained from this unit.

1.0 m Slump Covered: Assumed to be predominantly sand.

A number of boulders, up to 2 m in size, are present in the pit. They appear to be from the upper unit.

This small ice-contact feature lies within an extensive area of ablation till. Similar small deposits may be present elsewhere within the area. However, their lack of significant topographic expression prevents their identification using aerial photographs.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		100.0	99.7	95.6	80.1	66.0	51.6	29.2	14.1	6.5	2.9
B	(wet sieve)						100.0	99.6	85.8	43.1	14.8
C											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
Ice-contact			limited
Ablation till			abundant quantities of low-grade material

LOCATION #: G11-10 **(cont'd)**

Observations along Highway 4, a new logging road beside the powerline just to the south, and within McAdam, indicate that the ablation till consists of sand and angular gravel, with highly variable silt, cobble and boulder contents. Exposures of up to 3 m were observed. This deposit is quite hummocky, and also ridged in places.

Bedrock outcrops along the logging road may indicate that some of the relief exhibited by the ablation till may be due to bedrock. There are also a large number of small bogs scattered throughout the area. However, many of the ridges and hummocks could constitute good sources of low-specification aggregate. The abundant granitic boulders could constitute a good source of rip-rap.

LOCATION #:	G11-11	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	315 596

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material.

1.6 m Sand and/or Gravel: Crudely stratified gravelly sand, sand and gravel, and openwork gravel; the sand is predominantly coarse, while the gravel is fine to coarse and slightly cobbly, with a very few boulders up to 0.5 m in size; sample A was obtained from this unit.

0.9 m Sand and Gravel: Crudely stratified medium to coarse sand and fine to coarse gravel; sample B was obtained from this unit.

0.4 m Slump Covered: Possibly finer than above; fine to medium sand appears on portions of the pit bottom; the base of the pit is approximately 1.5 m above the stream level.

Clasts in this deposit are predominantly subrounded, with light to moderate silt coatings.

Up to the point where it is cut through by Cranberry Brook, the crest of the esker has been cleared and levelled for use as a logging road. Observations indicate that the material consists of sand and gravel, with frequent cobbles and occasional boulders. However, the fan at the end of the road appears to

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		72.9	65.7	50.1	39.7	25.0	12.2	4.0	1.8	1.1	0.7
B		80.8	76.3	69.9	63.7	55.3	40.7	7.0	2.6	1.6	0.9
C	(partial B)				100.0	86.8	63.9	11.0	4.1	2.5	1.4

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 21%	Sound Lithotypes 79%
felsic intrusive 12; weathered 6; chert 2; sandstone 1	felsic intrusive 56; metasedimentary 6; sandstone 5; mafic extrusive 3; greywacke 3; felsic extrusive 2; quartzite 2; mafic intrusive 1; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)		area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
Cranberry Brook	12	12	2	240,000
Duck Brook	2	2	1	20,000

LOCATION #: G11-11 **(cont'd)**

consist predominantly of sand. Reserve estimates pertain to the entire ridge system between the pit area and Money Point on Magaguadavic Lake.

Reserves are also calculated for a small esker running along Duck Brook, on the west side of Magaguadavic Lake. Considerable reserves of low-grade material may be present in ablation till deposits (not mapped) along Cranberry Brook. The boggy nature of the terrain may limit access to this material, however.

LOCATION #:	G11-12	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker fan)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Active	UTM:	333 509

SECTION DESCRIPTION & COMMENTS:

North face, west end

0.3 m Overburden: Removed; estimated thickness.

0.8 m Sand: Subhorizontally stratified medium sand; upper 0.3 m is oxidized; this unit is locally thicker.

1.1 m Sandy Gravel: Horizontally stratified fine to coarse gravel, with occasional small cobbles, and a matrix of medium to coarse sand.

0.8 m Sand: Cross-stratified medium sand, with the strata delineated by very thin coarse sand and gravel layers; this unit forms a large lens which wedges out laterally.

0.9 m Sand and Gravel: Crudely stratified medium to coarse sand and fine to coarse, slightly cobbly, gravel.

1.0 m Slump Covered: Assumed to be material as above.

Sample A is a composite sample from all of the above units. Clasts are subrounded, with light to moderate silt coatings, and minor manganese oxide coatings.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		82.2	78.3	68.9	61.8	54.6	44.6	18.1	2.6	1.0	0.4
	B		100.0	99.8	98.5	94.3	79.7	61.9	30.0	11.5	3.6	1.3
	C	(partial B)				100.0	84.5	65.7	31.8	12.2	3.8	1.4

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 25%	Sound Lithotypes 75%
felsic intrusive 21; sandstone 2; chert 1; metasedimentary 1	felsic intrusive 50; sandstone 12; metasedimentary 4; mafic extrusive 3; felsic extrusive 2; gneiss 2; greywacke 1; quartzite 1

ESTIMATION OF RESERVES:

total deposit area (hectares)		area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
esker fan	2.5	1	3	30,000
esker	7	7	2	140,000

LOCATION #: G11-12 (cont'd)

West face, centre (composite of a 2.5-3.0 m section)

0.3 m Overburden: Soil development on the underlying material; slightly silty.

0.2-1.2 m Sand: Generally massive (minor stratification towards the base) slightly silty fine sand to fine to medium sand, with frequent boulders (up to 3 m in size); occurs as trough fillings.

0.0-1.0 m Gravelly Sand: Poorly sorted, horizontally stratified fine to coarse sand with minor fine gravel, and a very few small cobbles; the above troughs occasionally cut completely through this unit.

0.8 m Sand: Apparently massive medium sand, with very minor pebbles.

0.3 m Slump Covered: Assumed to be material as above.

Sample B is a composite sample from all of the above units.

On the day the pit was visited, a small, tracked loader was present on site. The pit appears to have been operated quite actively in the recent past, many relatively fresh faces being present.

A maximum of 2.5 m of gravelly sand is exposed in a small pit just south of White Beaver Brook (UTM 332 508). Limited reserves are present. A small pit in another esker fan (UTM 332 505) exposes approximately 2 m of sand with minor gravel. Reserves are limited at this site due to its use as a dump. The remainder of the esker to the south, extending down to the airfield, is depleted. A large dump is present in this deposit just south of Highway 4.

That section of the esker extending from Modsley Lake south to the first esker fan is undeveloped. Reserves for this deposit are calculated based on an estimated average cross-section of 15 m by 2 m.

LOCATION #: G11-13
NTS: 21 G/11
Type of Deposit: Ice-contact (esker)
County: York
Exposure Type: Pit
Parish: McAdam
Status: Active on demand
UTM: 352 481

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material; slightly silty.

2.3 m Sand with Gravel: Subhorizontally stratified medium to coarse sand grading downwards into predominantly medium sand; contains frequent thin stringers of fine gravel, particularly in the upper 1.7 m; these stringers contain occasional cobbles, up to 0.3 m in size; clasts are predominantly granitic, and subrounded in shape.

0.7 m Slump Covered: Assumed to be material as above.

This section is the current face of a pit which has been worked along the esker from northwest to southeast, over a distance of approximately 1.5 km. This area to the northwest is largely depleted, except for two small pits (UTM's 343 489 and 349 484) which contain limited reserves of sand. Reserve estimates pertain to that section of the esker above the esker fan to the southeast (G11-14).

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		99.4	98.9	96.5	93.0	88.3	71.4	17.4	2.3	1.0	0.5
	b	(partial)				100.0	95.0	76.8	18.7	2.5	1.1	0.6
	c											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
see above	1	3	30,000

LOCATION #:	G11-14	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker fan)	County:	York
Exposure Type:	Pit	Parish:	McAdam
Status:	Inactive	UTM:	357 479

SECTION DESCRIPTION & COMMENTS:

Northern pit

0.3 m Overburden: Soil development on the underlying material; silty.

2.3 m Sand, Gravelly Sand, and Sand and Gravel: Horizontally interstratified layers of slightly gritty medium sand, gravelly medium to coarse sand, and medium to coarse sand and fine to medium gravel; the non-gravelly sand comprises approximately half of the section; clasts are predominantly subrounded, with nil to light silt coatings.

2.0 m Slump Covered: Assumed to be material as above.

Sample A was obtained from this section.

Southeastern pit

0.3 m Overburden: As above.

1.0 m Sandy Gravel: Crudely stratified, cobbly, predominantly fine to medium gravel, with a matrix of medium to coarse sand; occasional weathered clasts are evident.

0.7 m Gravelly Sand: Stratified, gravelly medium to coarse sand; is gradational into the above unit.

3.0 m Slump Covered: Assumed to be sand and/or gravel.

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		90.4	85.3	73.1	62.3	50.9	37.7	13.7	2.1	1.0	0.6
	B	82.5	63.1	59.2	48.9	41.0	34.1	24.6	4.6	1.4	0.8	0.5
	C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 20 %	Sound Lithotypes 80 %
felsic intrusive 15; weathered 4; chert 1	felsic intrusive 58; metasedimentary 7; greywacke 6; sandstone 4; mafic intrusive 2; quartzite 2; felsic extrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)		area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
esker fan	15	15	2	300,000
esker segment to east-south-east	1.5	1.5	1	15,000

LOCATION #: G11-14 (cont'd)

Sample B was obtained from the above section. A number of large granitic boulders (up to 2.5 m in size) are present in the pit area.

The western portion of this esker fan has been heavily worked. However, as shown by the presence of a small lower lift extending approximately 1.5 m below the base of the above sections, a considerable amount of workable material is still present in the pit areas. To the east, the deposit is thinner, and therefore the estimated average deposit thickness is not great. Limited exposures in this eastern portion of the deposit suggest that much of the material here may be fine.

Reserve estimates are also included for that portion of "The Horseback" lying to the east-southeast of the esker fan. A tiny abandoned pit (UTM 366 476) in this part of the esker exposes 2 m of sand and gravel. The crest height of the esker decreases from greater than 3 m above the pit to approximately 1 m at the eastern terminus.

LOCATION #:	G11-15	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Roadside pit	Parish:	Manners Sutton
Status:	Abandoned	UTM:	375 429

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material; somewhat silty.

0.8 m Sand and Gravel: Medium to coarse sand and fine to coarse gravel, with very few cobbles; maximum clast size is 0.25 m; clasts are subrounded, with light to moderate silt coatings, and minor manganese oxide coatings; no stratification is evident.

1.2 m Slump Covered: Assumed to be material as above.

This tiny esker is approximately 1.2 km long, and averages 10 m in width (it is 20 m wide in the pit area). Its surface ranges from 0 m (200 m east of the pit) to approximately 2 m (in the pit area) above the surface of the bog to the north.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing a		78.0	71.9	57.8	45.4	32.2	19.7	5.7	3.0	2.2	1.6
b											
c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 37%	Sound Lithotypes 63%
sandstone 17; weathered 7; felsic intrusive 5; shale 2; metasedimentary 2; schist 2; siltstone 1; slate 1	sandstone 18; felsic intrusive 12; quartzite 11; metasedimentary 10; mafic extrusive 3; greywacke 3; argillite 3; felsic extrusive 1; siltstone 1; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
1.2	1.2	1	12,000

LOCATION #: G11-16

NTS: 21 G/11

Type of Deposit: Ice-contact (esker fan)

County: York

Exposure Type: Pit

Parish: Prince William

Status: Abandoned

UTM: 407 668

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material.

0.6 m Gravelly Sand: Medium to coarse sand with minor fine gravel and very few cobbles; the sand is very granitic, as are the clasts; maximum clast size is 0.3 m.

0.5 m Sand: Stratified fine sand grading downwards into fine to coarse sand; contains occasional slightly silty layers; palaeoflow direction is towards the south.

3.0 m Slump Covered: Assumed to be material as above.

This deposit appears to consist of an esker partially buried by esker fan sediments (and possibly some outwash). What appears to be a morainic ridge lies just to the north of the deposit.

Exposures in this deposit are limited. However, most of the observed material was fine. This material may be suitable for use as fine concrete aggregate.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		97.5	97.3	94.1	88.3	78.4	65.5	40.9	19.4	6.1	1.7
	b	(partial)				100.0	88.8	74.1	46.3	22.0	6.9	1.9
	c											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m³) probable
25	8	3	240,000

LOCATION #:	G11-17	NTS:	21 G/11
Type of Deposit:	Ice-contact	County:	York
Exposure Type:	Pit	Parish:	Prince William
Status:	Active on demand	UTM:	411 593

SECTION DESCRIPTION & COMMENTS:

Upper lift

0.4 m Overburden: Soil development on the underlying material.

2.8 m Sand: Stratified and trough cross-stratified, predominantly fine sand, with occasional medium sand and silty fine sand layers; palaeoflow direction is towards the south.

2.7 m Gravelly Sand: Trough cross-stratified medium, and medium to coarse, sand, with minor fine gravel.

4.2 m Sand: Horizontally stratified fine to medium sand, with occasional layers of silty fine sand.

7.0 m Slump Covered: Assumed to be sand.

Sample A is a composite sample from all of the above units.

Lower lift

0.8 m Sandy Gravel: Crudely stratified, fine to coarse, cobbly gravel with frequent boulders, and a matrix of medium to coarse sand; maximum clast size is 1 m; clasts are subrounded (minor subangular), with light silt coatings; sample B was obtained from this unit.

2.2 m Slump Covered: Assumed to be material as above.

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600μm	300μm	150μm	75μm
% passing	A		99.7	99.6	99.0	97.4	94.3	86.7	64.8	37.7	13.8	4.5
		(partial)				100.0	96.8	89.0	66.5	38.7	14.2	4.6
	B	85.9	52.3	48.7	40.0	32.7	23.5	16.3	6.7	2.2	1.2	0.8

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 22%	Sound Lithotypes 78%
felsic intrusive 15; weathered 4; sandstone 2; chert 1	felsic intrusive 54; sandstone 9; metasedimentary 7; quartzite 4; siltstone 2; argillite 2

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)		average thickness (metres)	recoverable reserves (m^3) probable
60	A	20	10	2,000,000
	B	20	2	400,000

LOCATION #: G11-17 **(cont'd)**

Occasional large boulders, up to approximately 4 m in size, are present within the pit area.

The described section is at the southern end of an immense pit, the face of which is over 1 km in length and from approximately 10 to 17 m in height, while the pit floor averages approximately 200 m in width. Only this southern area is currently being worked (by D.O.T. with one loader when visited), the remainder of the area being abandoned. An estimated 3 million m^3 of material has been removed from this site. According to Hamilton & Carroll (1975), the pit was operated by Canadian Pacific Railway, and the material used for fine aggregate and ballast.

Reserves are estimated in two parts: A, that material to the west of the pit face (probably predominantly fine), and B, that material (possibly coarse) below the pit floor. This deposit appears to have potential as a possible source of both coarse and fine concrete aggregate (the fine material being derived by mixing the coarser sand associated with the gravel with the finer sand from the main pit face).

Minor reserves may be associated with the esker deposits to the west. However, much of this area, and the northern part of the main deposit along Magaguadavic Lake, are occupied by cottages.

LOCATION #:	G11-18	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Prince William
Status:	Inactive	UTM:	411 587

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material; somewhat silty.

1.0 m Sand and Gravelly Sand: Faintly stratified medium to coarse sand, frequently gravelly, and with occasional sand and gravel lenses; the gravel is predominantly fine to medium, and subrounded in shape; the palaeoflow appears to have been towards the south; sample A was obtained from this unit.

1.4 m Sandy Gravel: Crudely stratified fine to coarse, slightly cobbly gravel, with a medium to coarse sand matrix; maximum clast size is 15 cm; clasts are predominantly subrounded, with nil to light silt coatings; sample B was obtained from this unit.

2.0 m Slump Covered: Assumed to be material as above.

The upper sand unit appears to be more extensive on the flanks of the deposit, while locally, the gravel unit extends to the surface. The sand unit and the upper portion of the gravel unit contain localized lenses of iron cementation.

This deposit could extend further to the southeast, adjacent to the drainage channel. If so, reserves could be significantly greater.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A		96.0	94.0	85.1	74.4	52.1	33.3	12.5	3.6	1.2	0.5
	B		63.3	57.2	45.9	38.3	29.9	20.2	6.0	1.3	0.6	0.3
	C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 20%	Sound Lithotypes 80%
felsic intrusive 17; sandstone 2; metasedimentary 1	felsic intrusive 57; sandstone 8; greywacke 6; metasedimentary 4; mafic intrusive 3; quartzite 1; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
15	15	4	600,000

LOCATION #:	G11-19	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Active on demand	UTM:	449 557

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material.

1.5 m Sand and Gravel: Horizontally stratified, relatively poorly sorted sand and gravel; the sand is medium to coarse, while the gravel coarsens downwards from fine to medium gravel with minor cobbles to fine to coarse, cobbly gravel; clasts are up to 0.3 m in size.

1.0 m Gravelly Sand: Cross-bedded fine to medium sand, with very minor gravel, grading downwards into medium to coarse, gravelly sand; the gravel is predominantly fine.

0.6 m Sand: Trough cross-bedded fine to medium sand with minor silty bands.

1.0 m Sand and Gravel: Crudely stratified medium to coarse sand and fine to coarse gravel, with occasional cobbles.

0.3 m Sand: Horizontally laminated fine to medium sand.

0.4 m Sand and Gravel: Horizontally stratified medium to coarse sand and predominantly fine to medium gravel.

0.4 m Gravelly Sand: Horizontally stratified medium to coarse sand with minor, predominantly fine, gravel.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		91.7	89.1	82.6	74.7	63.6	50.3	28.8	10.5	3.6	1.0
	b	(partial)				100.0	85.3	67.3	38.6	14.1	4.8	1.3
	c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 22%	Sound Lithotypes 78%
felsic intrusive 19; sandstone 3	felsic intrusive 60; metasedimentary 5; sandstone 4; greywacke 4; quartzite 4; mafic extrusive 1

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
A	4.5	2	1	20,000
B	3	3	2	60,000
C	5	5	3	150,000

LOCATION #: G11-19 **(cont'd)**

1.2 m Slump Covered: Assumed to be sand and/or gravel; a large boulder, approximately 2.5 m in size, is present at this level in the pit.

Clasts in this deposit are subrounded, with nil to very light silt coatings, and minor manganese oxide coatings. The sample is a composite sample from all of the above units. This material may be suitable for use as concrete aggregate.

The ridged portion of this deposit, to which the above section applies, is largely depleted. The reserves (estimate A) are contained primarily in the shallower flanking material to the north of the ridge.

Reserve estimates are also included for the esker segments to the west (estimate B) and south (estimate C) along Davis Brook. The segment to the west runs through an area of generally shallow ablation till. It has a height of about 2 to 4 m. Limited exposures indicate that it consists of sand and gravel, with abundant cobbles and small boulders. Exploitation may be limited by the fact that the access road to Magaguadavic Lake runs along the crest. The material in the segment to the south is probably sandier, with a composition most likely similar to that in the section described above.

These two segments may actually be connected. However, if so, the material will be quite thin, since bedrock was observed in Davis Brook at the eastern end of the segment to the west, and at the intersection of the access road and Highway 4.

LOCATION #:	G11-20	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Prince William
Status:	Abandoned	UTM:	470 655

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; silty; includes 0.1 m of organic material at the top.

0.8 m Sandy Gravel: Fine to coarse gravel, with a few cobbles, and a matrix of predominantly medium sand; maximum clast size is 0.3 m; clasts are predominantly subrounded (minor rounded), with light silt coatings, and minor manganese oxide coatings; no structure is visible.

1.2 m Slump Covered: Assumed to be material as above.

Field observations indicate that the outwash consists predominantly of sand and gravel. The water table will be relatively high in this material, as shown by the boggy nature of the surrounding area, and consequently the average workable thickness will be small. The area of inferred outwash on the west side of the esker at its southern end may actually consist of ice-contact material, or possibly ablation till.

MECHANICAL ANALYSIS:

sieve	50mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing		64.5	54.3	32.3	23.3	19.5	17.9	14.1	5.0	1.8	1.0
D.O.T. (1973)	95		59	41	33	28		11			1.7

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 15%	Sound Lithotypes 85%
felsic intrusive 6; sandstone 4; chert 3; metasedimentary 2	quartzite 28; felsic intrusive 17; sandstone 15; greywacke 11; mafic extrusive 5; metasedimentary 5; siltstone 2; quartz 2

ESTIMATION OF RESERVES:

total deposit area (hectares)		area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
outwash	75	75	1	750,000
ice-contact	65	60	5	3,000,000

LOCATION #: G11-20 **(cont'd)**

No exposures were observed in the esker within the map-area. However, a large working on the west side of Highway 635, approximately 3 km north of the map boundary, exposes sand and gravel. D.O.T. (1973) sieve analysis results are entered in the Mechanical Analysis section. This material exhibited a Los Angeles Abrasion Loss of 21.1%. The material has been extensively used for asphaltic concrete aggregate (after crushing). Approximately 500 m to the south along the highway, on the east side, a small pit on the flank of the esker exposes approximately 3 m of sand.

Based on the above information, it appears that the portion of the esker within the McAdam area may have potential as a source of high-specification aggregate. However, if its chert content is similar to that of the flanking outwash, it may not be suitable for use as concrete aggregate. Detailed testing would be required to accurately determine the quality of the deposit.

LOCATION #:	G11-21	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Abandoned	UTM:	492 623

SECTION DESCRIPTION & COMMENTS:

0.5 m Overburden: Soil development on the underlying material; silty.

1.0 m Sandy Gravel: Very crudely stratified fine to coarse, cobbly gravel, with a medium to coarse sand matrix; maximum clast size is 0.3 m; clasts are predominantly subrounded (minor rounded), with light silt coatings, and minor manganese oxide coatings.

1.0 m Slump Covered: Assumed to be material as above; the base of the pit lies approximately at the water table.

Field observations indicate that the water table lies very close to the surface along the western margin of this deposit. Consequently, the estimated average workable thickness is small.

Similar material may be present to the northeast, to either side of the Northeast Branch Magaguadavic River. However, the topographic configuration and somewhat higher elevation is taken to indicate the presence of till and/or bedrock in that area.

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a	85.2	48.2	41.7	29.6	21.7	16.1	11.8	3.8	1.2	0.7	0.5
	b											
	c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 13%	Sound Lithotypes 87%
sandstone 8; felsic intrusive 3; weathered 2	sandstone 17; quartzite 16; metasedimentary 14; greywacke 13; felsic intrusive 10; felsic extrusive 7; siltstone 5; mafic intrusive 2; mafic extrusive 2; quartz 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
55	50	1	500,000

LOCATION #:	G11-22	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker fan)	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Active	UTM:	471 552

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; very silty.

3.0 m Sand and Gravel, and Sandy Gravel: Horizontally stratified, poorly sorted fine to coarse sand and fine to coarse, cobbly gravel, and slightly bouldery, cobbly, sandy fine to coarse gravel; minor lenses of fine sand or coarse sand and fine gravel are present; clasts are subangular to subrounded, with moderate to heavy silt coatings.

1.1 m Slump Covered: Assumed to be material as above.

The above description pertains to the west face of the pit. The material to the north and east appears similar. However, the material to the south appears to be less cobbly and bouldery, and much sandier.

This pit has been actively operated by D.O.T., the material being used in the up-grading of the shoulders of Highway 3 between Coburn and Thomaston Corner. At the time of the visit, scales, a loader, and a large stockpile of crushed material were present on site.

MECHANICAL ANALYSIS: D.O.T. (1973, 1980); average of 23 samples

sieve		50mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a	72		56	45	35	27		13			4.7
	b											
	c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 44%	Sound Lithotypes 56%
sandstone 26; weathered 13; felsic intrusive 2; chert 1; shale 1; metasedimentary 1	sandstone 27; metasedimentary 11; felsic intrusive 8; felsic extrusive 4; greywacke 3; quartzite 2; mafic extrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
55	40	6	2,400,000

LOCATION #: G11-22 **(cont'd)**

D.O.T. (1973, 1980) test data is as follows:
- Sieve Analyses (23 samples):
  - between 23% and 46% passing 4.75 mm (35% average)
  - between 2.3% and 6.9% passing 75 µm (4.7% average)
- Los Angeles Abrasion Loss (from 23 samples):
  - 29.9% to 38.2%
- Crushed Sample:
  - 43% passing 4.75 mm, 6.5% passing 75 µm
  - Sand Equivalent - 27
  - Absorption - stone 3.16%, sand 0.84%
  - Soundness Loss - stone 9.66%, sand 8.87%
- Recommended for use as borrow and subbase aggregate. Of marginal quality for use as base (31.5 mm crushed) or asphaltic aggregate.

To the south of this pit, the deposit has been heavily worked. The main pit in this area (UTM 472 549) exposes approximately 6.5 m of similar material (with an estimated 1 m having been removed from the surface). Light carbonate cementation is evident in the accessible material in the lower portion of the face. At the southern margin of the deposit, a lower lift (UTM 474 548) exposes about 4 m (an estimated 2 to 3 m having been removed from the surface) of trough cross-stratified medium to coarse sand and fine to medium gravel. This material exhibits very heavy carbonate cementation, and locally approaches the consistency of conglomerate. Most of the pits (only 4 can be shown on the map) in this southern portion of the deposit appear to be active on demand. Traces of asphaltic waste indicate that the material has been used in the past for asphaltic concrete.

This deposit appears to be an esker fan, formed at the confluence of 3 major subglacial drainage channels. An ice-contact origin for the deposit is supported by the fact that D.O.T. (1973) data indicates that "boulder till" (probably ablation till) is intimately associated with the sand and gravel near the northern margin of the deposit.

LOCATION #:	G11-23	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Inactive	UTM:	479 543

SECTION DESCRIPTION & COMMENTS:

0.5 m Overburden: Soil development on the underlying material.

1.8 m Sandy Gravel: Crudely stratified, very poorly sorted, cobbly and bouldery fine to coarse gravel, with a matrix of medium to coarse sand; maximum clast size is 1 m; clasts are predominantly subrounded (minor subangular, rounded), with light to moderate silt coatings, and minor manganese oxide coatings; the sample comprises only that material finer than 10 cm in size; the cobble and boulder content was visually estimated at approximately 20%.

5.0 m Slump Covered: Assumed to be material as above.

Maximum section height in this pit is 7.5 m. Immediately to the east is an older, abandoned, pit up to 9 m deep, extending 3.5 m below the level of the more recent pit.

This deposit has been extensively tested by D.O.T. (1973). This data indicates that the deposit is somewhat variable, but consists predominantly of

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing a		67.1	60.3	41.9	31.5	20.9	12.6	4.4	2.1	1.5	1.2
b											
c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 30%	Sound Lithotypes 70%
sandstone 13; weathered 8; siltstone 4; felsic intrusive 2; chert 2; shale 1	felsic intrusive 22; sandstone 18; quartzite 14; greywacke 6; mafic extrusive 3; argillite 2; meta-sedimentary 2; felsic extrusive 1; siltstone 1; metavolcanic 1

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m³) probable
A	5	2	7	140,000
B	11	11	3	330,000

LOCATION #: G11-23 **(cont'd)**

sand and gravel or sandy gravel, with sand and gravelly sand being minor. Most of this finer material appears to be concentrated towards the southern portion of the deposit. One sample from below the base of the old pit indicates that the material may become even less sandy with depth. This D.O.T. (1973) data is summarized below:

Sieve Analyses - fine material (3 samples):
between 71% and 77% passing 4.75mm (75% average)
between 1.4% and 3.0% passing 75µm (1.9% average)

- coarse material (22 samples):

between 26% and 58% passing 4.75mm (45% average)
between 0.7% and 2.4% passing 75µm (1.6% average)

- very coarse material (1 sample from floor of pit):

15% passing 4.75mm, 1.8% passing 75µm

Los Angeles Abrasion Loss (from 24 samples):
27.7% to 36.3%

The finer material is recommended for use as borrow, and as a possible source of blending, winter, and filter sand (screening required). The coarse two-thirds of the coarse samples were recommended for use as borrow, subbase, and base course (31.5mm crushed) aggregate, with the remainder being recommended for use as borrow and subbase only.

Reserve estimate A pertains to this deposit. Reserve estimate B pertains to the two ice-contact deposits within the outwash area to the northwest. These deposits are probably continuations of the Davis Brook esker (G11-19), and correlative with the deposits at G11-22 and 23. Their composition is unknown, but, based on observations in the other deposits, they are probably coarse.

LOCATION #:	G11-24	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Inactive	UTM:	484 532

SECTION DESCRIPTION & COMMENTS:

0.6 m Overburden: Soil development on the underlying material; silty.

0.8 m Sandy Gravel: Crudely stratified and poorly sorted fine to coarse, slightly cobbly gravel, with a medium to coarse sand matrix; the upper 0.3 m is oxidized; sample A was obtained from this unit.

0.9 m Gravelly Sand: Interstratified gravelly medium and gravelly coarse sand; gravel is predominantly fine; sample B was obtained from this unit.

1.5 m Slump Covered: Assumed to be sand and/or gravel; the base of the pit lies approximately at the water table.

Maximum clast size is 0.8 m. Clasts are subrounded, with moderate silt coatings, and minor manganese oxide coatings.

Reserves are calculated for 3 areas: A - the area on the west side of the Magaguadavic River, along Davis Brook and extending approximately half way down Thomas Brook, B - the area to the east of the Magaguadavic River and north of

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		63.0	55.6	41.0	31.5	23.7	15.2	4.4	1.5	0.9	0.6
B		98.7	95.8	86.3	74.7	58.1	39.7	11.2	1.8	1.1	0.7
C	(partial B)				100.0	77.8	53.1	15.0	2.4	1.4	1.0

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 27%	Sound Lithotypes 73%
sandstone 13; felsic intrusive 7; weathered 5; metasedimentary 1; chert 1	felsic intrusive 25; greywacke 18; sandstone 12; quartzite 6; metasedimentary 5; mafic extrusive 3; quartz 2; felsic extrusive 1; metavolcanic 1

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
A	170	120	2	2,400,000
B	175	150	2	3,000,000
C	25	8	2	160,000

LOCATION #: G11-24 (cont'd)

Pratts Brook, and C - the thin strip of land between Thomas Brook and the Magaguadavic River, south of the confluence of the latter and Pratts Brook. See G11-25 (west) and G11-26 (east) for details concerning the material further to the south.

In the northern part of the first area (A), along Davis Brook, the material appears to consist predominantly of cobbly, sandy, coarse gravel. However, a relatively shallow water table locally restricts workable thicknesses to approximately 1 m. However, the workable thickness increases to approximately 3 m towards the south, as shown by the above section.

In the second area (B), good exposures are limited to two small pits. Both of these pits expose approximately 3 m of sand and coarse gravel. The northern one (UTM 486 545) is abandoned, but the southern one (UTM 494 531) is lightly active on demand.

In the third area (C), a tiny, abandoned pit (UTM 492 518) exposes approximately 3 m of gravelly sand. The workable area of this portion of the deposit is largely limited by the presence of Highway 3.

In all 3 cases, buried eskers, related to the one at G11-23, may be present. This material would probably be more like that at G11-23 than as described above. The most likely locations are along Highway 3, and in the southern portion of area B.

LOCATION #: G11-25
Type of Deposit: Glaciofluvial outwash
Exposure Type: Pit
Status: Active

NTS: 21 G/11
County: York
Parish: Manners Sutton
UTM: 483 481

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material.

2.6 m Sand and Gravelly Sand: Cross-bedded sand, varying from well sorted fine to medium sand to moderately sorted, pebbly medium to coarse sand; medium sand is predominant; minor stringers of fine to medium, and occasionally coarse, gravel are present; clasts are subrounded, with minor silt coatings.

1.3 m Slump Covered: Assumed to be predominantly sand.

Only 2 or 3 boulders, up to 0.7 m in size, are present in the pit area, along with a few cobbles in the 0.2-0.3 m size range.

Two loaders were present (not active) when the pit was visited.

Reserves are calculated for that material on the west side of the Magaguadavic River, between Thomas and Stone Brooks. Observations along Highway

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing a		96.5	96.3	93.4	88.9	77.0	57.2	29.3	7.2	2.4	1.2
b	(partial)				100.0	86.5	64.3	33.0	8.1	2.7	1.3
c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 12%	Sound Lithotypes 88%
felsic intrusive 5; sandstone 3; siltstone 1; chert 1; slate 1; weathered 1	felsic intrusive 35; quartzite 21; metasedimentary 10; sandstone 9; greywacke 9; argillite 2; felsic extrusive 1; quartz 1

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
upper level	330	200	3	6,000,000
lower level	40	25	2	500,000

LOCATION #: G11-25 (cont'd)

3 indicate that much of the material north of Upper Brockway consists of sand and gravel, while much of that to the south consists of sand and pebbly sand. However, exposures at the dump site (UTM 483 472) indicate that the sand may overlie sand and gravel, at least locally.

The presence of kettle holes, formed by the melting out of buried ice blocks, indicates that deposition of the upper outwash level occurred in close proximity to an ice margin.

Limited exposures on the lower terrace level, at the southern end of the deposit, indicate that much of the material probably consists of pebbly sand.

LOCATION #:	G11-26	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Inactive	UTM:	488 467

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material; slightly silty.

1.3 m Gravelly Sand: Horizontally stratified medium to coarse sand with fine gravel; maximum clast size is 0.45 m; clasts are subrounded, and approximately 50% granitic.

0.6 m Slump Covered: Assumed to be material as above.

The reserve estimates pertain to all of the outwash material on the east side of the Magaguadavic River, to the south of Pratts Brook. Access to this area is poor, being limited to the area adjacent to the Tweedside Road, and the pit access road which runs up from it. Probing to a depth of 1 m with a soil probe indicates that most of the material consists of fine to medium sand.

Based on aerial photograph interpretation, supplemented by limited field observations, it appears that approximately one-third of the area is unworkable

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		99.6	97.1	83.6	70.9	50.1	36.4	12.5	2.1	0.6	0.3
	b	(partial)				100.0	70.7	51.3	17.7	3.0	0.9	0.4
	c											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
600	400	1	4,000,000

LOCATION #: G11-26 **(cont'd)**

(by conventional means) due to a shallow water table. Most of the boggy areas are adjacent to the eastern margin of the deposit, though the western portion of the deposit along the Tweedside Road is also wet.

In order to get a feeling for the depth of material in this deposit, a hammer seismic profile was obtained from a site along the access road, to the south of Brook Styx (UTM 480 439). The results, and interpretations, are as follows:

0.0 - 2.2 m	sand	(velocity = 667 ms^{-1})
2.2 - 5.0 m	weathered bedrock	(velocity = 2222 ms^{-1})
5.0 + m	competent bedrock	(velocity = 5000 ms^{-1})

Based on this information, and on the shallow water tables observed elsewhere, it appears that the average workable thickness is not great.

LOCATION #:	G11-27	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Active on demand	UTM:	474 450

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; slightly silty.

1.2 m Sand and Gravel: Crudely stratified, poorly sorted medium to coarse sand and fine to coarse, cobbly gravel; clasts are predominantly subrounded (minor rounded), with light silt coatings; sample A was obtained from this unit.

0.6 m Gravelly Sand: Stratified medium to coarse sand with fine to medium gravel.

0.7 m Sand: Well-sorted medium sand, with no visible stratification; sample B was obtained from both this unit and the above unit.

1.4 m Slump Covered: Assumed to be sand.

1.9 m Sand: Cross-stratified medium sand with minor fine sand; the stratification dips steeply to the southeast; sample C was obtained from this unit.

0.8 m Gravelly Sand: Stratified medium sand with minor fine to medium gravel.

1.0 m Slump Covered: Assumed to be sand and/or gravel.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	57.7	54.9	46.9	41.3	33.2	25.4	6.1	1.7	1.0	0.7
	B	95.2	92.8	88.5	83.0	76.5	65.4	26.2	3.6	1.6	1.1
	C			100.0	99.8	99.8	99.0	89.8	22.0	2.4	0.8

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 34%	Sound Lithotypes 66%
sandstone 15; felsic intrusive 6; weathered 4; mafic extrusive 3; siltstone 3; schist 2; shale 1	sandstone 18; metasedimentary 14; felsic intrusive 12; quartzite 8; greywacke 7; felsic extrusive 3; mafic extrusive 2; siltstone 1; quartz 1

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
A	15	6	5	300,000
B	150	100	3	3,000,000
C	20	10	1	100,000

LOCATION #: G11-27 **(cont'd)**

Maximum clast size in the pit area is 0.3 m. D.O.T. (1974) test data indicates that the material becomes coarser again below the base of the pit. This D.O.T. (1974) data is summarized below:

Sieve Analyses - deposit surface level (3 samples):
  between 42% and 68% passing 4.75mm (55% average)
  between 1.5% and 2.4% passing 75µm (1.9% average)

- pit floor level (2 samples):

47% and 49% passing 4.75mm, 3.4% and 1.1% passing 75µm

Los Angeles Abrasion Loss (from 5 samples):

25.8% to 27.6%

Recommended for use as borrow, subbase, and as marginal quality base course aggregate.

Reserves are estimated for the area to the west of the Magaguadavic River, between Stone and Upper Trout Brooks. Three levels of outwash are present here: A - The high level material in which the above pit is developed, extending to the north along Highway 3, B - The intermediate level material comprising the bulk of the deposit, and C - The low level material at the southeastern end of the deposit.

Limited exposures indicate that most of the material in the lower two levels is predominantly sand.

LOCATION #: G11-28

Type of Deposit: Ice-contact (esker)

Exposure Type: Pit

Status: Inactive

NTS: 21 G/11

County: York

Parish: Manners Sutton

UTM: 458 420

SECTION DESCRIPTION & COMMENTS:

Southeast portion of section

0.4 m Overburden: Soil development on the underlying material; slightly silty.

2.1 m Sandy Gravel: Very crudely stratified medium to coarse, cobbly gravel, with occasional small boulders, and a matrix of medium sand; maximum clast size is 0.6 m; this unit contains numerous coarse gravel and cobble clasts which disintegrate when the unit is worked (redbed and weathered clasts); sample A was obtained from this unit.

1.1 m Slump Covered: Assumed to be material as above.

Northwest portion of section

0.4 m Overburden: As above.

1.2 m Sand and Gravelly Sand: Alternating beds of sand and gravelly sand; sand beds consist predominantly of medium sand, while the gravelly sand beds consist of medium to coarse sand with predominantly fine gravel; a few small cobbles are present; sample B was obtained from this unit.

0.3 m Sandy Gravel: Poorly sorted fine to coarse, slightly cobbly gravel, with a medium to coarse sand matrix; clasts are predominantly subrounded (minor subangular), with light to moderate silt coatings; no stratification is visible; this unit is correlative with, but somewhat finer than, the unit

MECHANICAL ANALYSIS:

sieve		100mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	76.6	37.3	31.3	24.9	22.4	21.1	18.8	9.1	3.7	2.2	1.4
	B		97.0	95.4	91.5	85.0	72.9	60.1	20.6	4.3	2.5	1.4
	C		74.0	62.1	45.1	36.9	28.5	18.3	6.3	2.1	1.4	1.0

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 37 %	Sound Lithotypes 63 %
sandstone 11; weathered 9; siltstone 6; shale 5; felsic intrusive 2; metasedimentary 2; schist 2	sandstone 21; felsic intrusive 11; quartzite 10; greywacke 9; metasedimentary 4; quartz 3; siltstone 2; argillite 2; mafic extrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
30	15	2	300,000

LOCATION #: G11-28 (cont'd)

to the southeast.

1.9 m Slump Covered: Assumed to be material as above.

Delineation on the aerial photographs of the esker ridge in the western portion of this deposit is difficult due to the nature of the vegetative cover. However, based on field observations, it appears to follow a very sinuous course. Reserves are calculated based on the assumption that approximately half of the mapped area is workable.

This deposit is probably a continuation of the esker along White Beaver Brook, to the northwest (G11-12, 13, 14), and continues to the southeast along the Magaguadavic River (G11-29, 31).

LOCATION #:	G11-29	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Active on demand	UTM:	477 414

SECTION DESCRIPTION & COMMENTS:

Crest

0.5 m Overburden: Soil development on the underlying material; slightly silty.

1.3 m Sandy Gravel: Crudely stratified, cobbly, coarse gravel, with occasional small boulders; the matrix consists of poorly sorted medium to coarse sand and fine gravel; clasts are subrounded (minor rounded), with light to moderate silt coatings; maximum clast size is 0.5 m; sample A was obtained from this unit.

7.0 m Slump Covered: Assumed to be sand and/or gravel.

Northeast flank (approximately 30 m from crest)

0.4 m Overburden: As above.

1.7 m Sand and Gravel: Subhorizontally stratified coarse sand and fine to medium, slightly cobbly gravel; strata are frequently slightly silty; sample B was obtained from this unit.

1.7 m Sand: Horizontally stratified medium sand with numerous small pebbles; sample C was obtained from this unit.

2.3 m Slump Covered: Assumed to be sand and/or gravel.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	83.6	44.4	39.9	32.2	26.3	18.1	11.5	5.0	2.3	1.5	1.0
	B		78.9	75.6	64.0	49.2	30.7	13.8	7.1	6.2	5.4	4.6
	C		99.2	98.9	97.0	95.0	91.3	74.3	13.5	4.4	2.2	0.9

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 47 %	Sound Lithotypes 53 %
sandstone 23; weathered 11; felsic intrusive 4; siltstone 3; shale 1; schist 1	sandstone 24; quartzite 11; felsic intrusive 9; greywacke 6; felsic extrusive 2; metasedimentary 2; quartz 2; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
16	8	5	400,000

LOCATION #: G11-29 **(cont'd)**

A subsidiary pit to the northwest, adjacent to Highway 3, has two lifts. The upper lift, approximately 3 m high, is slump covered and overgrown. The lower lift, 2.2 m high, exposes 0.3 to 1.2 m of predominantly medium sand overlying medium to coarse sand and fine to medium gravel.

D.O.T. (1974) data also indicates that the material in the pit area varies from sand to sandy gravel. However, sand and gravel appears to be dominant. This D.O.T. (1974) data is summarized below:

Sieve Analyses (7 samples):
  between 32% and 57% passing 4.75mm (48% average)
  between 1.1% and 5.6% passing 75μm (3.0% average)

Los Angeles Abrasion Loss (from 7 samples):
  26.0% to 27.9%

Recommended for use as borrow, subbase, and as marginal quality base course aggregate.

This esker segment is part of an esker system extending along Lower Trout Brook and southward along the Magaguadavic River (G11-28,31). This segment appears to have been partially buried by outwash deposits, and then subsequently re-exhumed, in part, by fluvial action.

LOCATION #:	G11-30	NTS:	21 G/11
Type of Deposit:	Glaciofluvial outwash	County:	York
Exposure Type:	Pit	Parish:	Manners Sutton
Status:	Inactive	UTM:	475 413

SECTION DESCRIPTION & COMMENTS:

Upper lift

0.4 m Overburden: Soil development on the underlying material; somewhat silty.

1.3 m Gravelly Sand: Faintly stratified medium, and lesser coarse, sand with predominantly fine to medium gravel; occasional small cobbles are present; clasts are subrounded; sample A was obtained from this unit.

3.1 m Slump Covered: Assumed to be sand or gravelly sand.

Lower lift

1.3 m Sand: Horizontally stratified fine sand, with some medium sand layers, and occasional slightly pebbly layers; sample B was obtained from this unit.

1.7 m Slump Covered: Assumed to be material as above; the base of the pit appears to be approximately at the water table.

This deposit is interpreted as an erosional remnant of high level outwash material. Reserve estimate A pertains to this deposit. To the north, similar material is present, partially burying the esker described at G11-29 (which has

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		95.1	92.7	87.3	79.2	70.8	55.3	21.7	3.4	2.1	1.4
	(partial)				100.0	89.3	69.7	27.4	4.3	2.6	1.7
B		99.4	99.1	97.7	96.7	95.3	94.0	89.9	72.1	19.9	5.7

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

	total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
A	11	6	6	360,000
B	120	90	4	3,600,000
C	100	70	1.5	1,050,000

LOCATION #: G11-30 (cont'd)

been subsequently re-exhumed, in part). A road cut just south of Brockway exposes approximately 2.5 m of sand and gravelly sand overlying 0.5+ m of sand and fine gravel, which is probably representative of much of the material in this deposit (except for the buried esker portion, which will probably be similar to that described at G11-29). Reserve estimate B pertains to that high level outwash on the west side of the Magaguadavic River, lying between Upper Trout Brook and the esker, and includes the material in the largely buried portion of the esker.

Reserve estimate C pertains to the low level outwash on the west side of the Magaguadavic River between Upper and Lower Trout Brooks. Observations indicate that this material consists predominantly of sand, frequently fine.

LOCATION #:	G11-31	NTS:	21 G/11
Type of Deposit:	Ice-contact (esker)	County:	Charlotte
Exposure Type:	Pit	Parish:	Dumbarton
Status:	Inactive	UTM:	501 403

SECTION DESCRIPTION & COMMENTS:

Upper lift

0.3 m Overburden: Soil development on the underlying material; slightly silty.

1.1 m Sandy Gravel: Poorly sorted, fine to coarse, slightly cobbly gravel, with a medium to coarse sand matrix; clasts are subrounded, with light to moderate silt coatings; maximum clast size is 0.3 m; faint stratification is visible; sample A was obtained from this unit.

1.8 m Slump Covered: Assumed to be sand and/or gravel.

The above description pertains to the southeastern face of the upper lift in the vicinity of the esker crest. At approximately the same level the southwestern face exhibits approximately 2 m (including soil zone) of well-sorted medium sand.

Lower lift (to the northwest of the upper lift face)

0.4 m Gravelly Sand: Medium to coarse sand with frequent medium to coarse gravel clasts.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600μm	300μm	150μm	75μm
% passing	A		75.9	69.2	50.2	34.3	22.5	18.1	14.0	5.9	1.9	1.1
	B		98.6	98.2	97.4	95.7	82.7	49.8	6.1	3.3	1.9	1.1
	C	(partial B)				100.0	86.4	52.0	6.4	3.5	2.0	1.2

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 42%	Sound Lithotypes 58%
sandstone 22; felsic intrusive 7; metasedimentary 5; weathered 4; chert 2; conglomerate 1; shale 1	sandstone 13; metasedimentary 13; greywacke 10; felsic intrusive 7; felsic extrusive 3; gneiss 3; quartzite 3; quartz 3; mafic extrusive 2; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)		area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
esker	9	9	3	270,000
outwash	135	100	1	1,000,000

LOCATION #: G11-31 **(cont'd)**

1.0 m Sand: Moderately well-sorted medium to coarse sand with a few pebbles; no stratification is evident; sample B was obtained from this unit.

1.8 m Slump Covered: Assumed to be sand and/or gravel; the base of the pit extends 0.4 m below this level, but was flooded as of late July, 1981.

The above section lies directly below the base of the upper lift. Approximately 10 m to the southwest, at the same level, the material consists of horizontally bedded, interstratified sand, gravelly sand, and sand and gravel, with an overall coarsening upward trend. The sand at this site is predominantly medium to coarse; the gravel fine to medium. At the flank of the esker, even further to the southwest (but again at the same level), the material consists of a coarse, cobbly and slightly bouldery gravel, with a matrix of medium sand. Maximum clast size is 0.5 m. To the northwest, an inactive pit (UTM 495 406) in a broad section of the esker exposes approximately 4.5 m of sand with some coarse, cobbly gravel.

As can be seen from the above descriptions, the material in this deposit exhibits extreme textural variability. However, it appears that sand will be predominant over gravel. Reserve calculations are for that portion of the esker south of Lower Trout Brook, and north of the southern boundary of the McAdam map-area.

Reserve estimates are also included for the flanking outwash (that lying south of Lower Trout Brook). Observations indicate that this material generally exceeds 1 m in thickness, and consists primarily of sand, frequently fine, with minor gravel in some areas. Occasional boulders are embedded in the surface. The small area on the east side of the Magaguadavic River, southeast of Anderson Cove, and the area west of Highway 3, are felt to have limited potential, and are therefore not included in the workable area.

LOCATION #: G11-32

NTS: 21 G/11

Type of Deposit: Ice-contact (esker)

County: York

Exposure Type: Pit

Parish: Manners Sutton

Status: Active on demand

UTM: 555 573

SECTION DESCRIPTION & COMMENTS:

0.5 m Overburden: Soil development on the underlying material; quite silty.

8.0 m Sand and/or Gravel: Crudely stratified, highly variable sand and gravel; the bulk of the material consists of poorly sorted, slightly dense, medium to coarse sand and fine to coarse, cobbly gravel, with occasional boulders; occasional layers and lenses of openwork gravel are present, as are minor lenses of fine to medium sand up to 0.4 m thick; clasts are subangular to subrounded, with moderate to heavy silt/clay coatings, and minor manganese oxide coatings; maximum clast size is 1.1 m; silt/clay coatings are particularly heavy in the openwork gravels; the sample is a composite of all the accessible units in the lower 2.5 m.

1.0 m Slump Covered: Assumed to be material as above.

The above section pertains to the maximum exposure within the pit. At this point the esker is approximately 50 m wide. This esker is quite variable in size. At its northern tip a roadcut exposes a maximum of 2 m of silty, sandy, cobbly gravel. Approximately 100 m southeast of the pit face the esker is only

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing a		46.9	43.2	35.1	30.1	24.6	18.6	9.2	4.2	1.5	0.8
b											
c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 27%	Sound Lithotypes 73%
sandstone 7; siltstone 5; weathered 5; felsic intrusive 3; chert 2; shale 2; metasedimentary 2; mafic extrusive 1	sandstone 27; felsic intrusive 11; metasedimentary 10; greywacke 7; quartzite 6; mafic intrusive 3; argillite 3; mafic extrusive 2; quartz 2; felsic extrusive 1; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
9	8	3	240,000

about 3 m high. However, it increases in size again further to the southeast.

The northwestern portion of the deposit contains some material of probable outwash (proximal) origin. Approximately 50 m west of the pit face, the pit access road cuts through a relatively flat-surfaced deposit, exposing approximately 2.5 m of sand and gravel. The exact extent of this material is unknown. A limited amount of outwash material may also be associated with the drainage channel to the west of the esker.

To the south, a small pit (UTM 546 536) is present in a deposit mapped as an esker by Gadd (1973) and described as outwash by Hamilton & Carroll (1975). An ice-contact (esker or possibly kame terrace) origin seems most likely. The material consists of sand and gravel with numerous angular sandstone and conglomerate blocks. Bedrock is exposed at a depth of 1 to 2 m below the surface. Most of the pit area is now used as a dump, though minor extraction activity has recently been undertaken in the northwestern corner of the pit area. Reserves are considered to be limited.

Much further to the south, a small roadside pit (UTM 507 467) with a face of approximately 3.5 m height, is present in a small ice-contact deposit, probably a kame. The visible material consisted of slightly silty sand and gravel with occasional cobbles and boulders. Only limited reserves are present.

Small deposits similar to the above two may be present elsewhere in the map-area. However, their small size and lack of significant topographic expression precludes their identification, except when they have been operated (as with the above, and G11-10). They may, however, comprise significant local aggregate sources, particularly if larger deposits are further away.

APPENDIX B

SAMPLE DESCRIPTIONS

OF

FOREST CITY MAP-AREA

21 G/12

LOCATION #:	G12-1	NTS:	21 G/12
Type of Deposit:	Ice-contact(?)	County:	York
Exposure Type:	Pit	Parish:	North Lake
Status:	Abandoned	UTM:	950 618

SECTION DESCRIPTION & COMMENTS:

0.6 m Overburden: Soil development on the underlying material; quite silty.

1.2 m Sand and Gravel: Poorly sorted, very slightly silty, medium to coarse sand and fine to coarse, cobbly gravel, with frequent boulders; maximum clast size is 1.7 m; clasts are subrounded, with light to moderate silt coatings; the sample is not representative of the cobble and boulder fraction of the deposit, which was visually estimated to comprise approximately 5% of the material.

1.7 m Slump Covered: Assumed to be material as above; the base of the pit is at the water table; a nearby water-filled hole extends at least 1 m below the base of the pit, possibly indicating greater potential volumes when the lake level is lower.

At some time in the past, material from this deposit has been screened, with the cobbles and boulders being left in stockpiles. Approximately 40 to 50% of the cobbles appear to be granitic, while all the observed boulders are granitic. Consequently, crushing will significantly improve the quality of the material.

MECHANICAL ANALYSIS:

sieve			25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	a		80.3	73.1	54.1	39.5	29.6	22.3	12.1	8.1	4.8	3.0
	b											
	c											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 32%	Sound Lithotypes 68%
sandstone 14; weathered 7; mafic extrusive 3; siltstone 3; shale 2; schist 2; manganiferous siltstone 1	sandstone 22; greywacke 15; metasedimentary 12; mafic extrusive 8; quartzite 4; siltstone 2; quartz 2; felsic intrusive 1; felsic extrusive 1; mafic intrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
3	1	2	20,000

LOCATION #: G12-1 **(cont'd)**

D.O.T. (1975) test data gives the following results:

Sieve Analyses (9 samples):
- between 36% and 71% passing 4.75 mm (49% average)
- between 3.7% and 8.1% passing 75 µm (5.4% average)

Los Angeles Abrasion Loss (from 9 samples):
- 24.5% to 26.4%

Recommended for use as borrow, subbase, and base course (31.5 mm crushed) aggregate.

This deposit appears to be an esker fan, associated with an esker, now submerged, running from north to south through the promontory.

LOCATION #:	G12-2	NTS:	21 G/12
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	North Lake
Status:	Inactive	UTM:	032 664

SECTION DESCRIPTION & COMMENTS:

Composite section, south face (maximum section height is 5.3 m).

0.3 m Overburden: Soil development on the underlying material; somewhat silty.

0-1.0 m Sand and Gravel: Moderately sorted medium to coarse sand and predominantly fine gravel; maximum clast size is 15 cm; clasts are subrounded, with nil to light silt coatings and minor manganese oxide coatings; this unit exhibits crude, subhorizontal stratification; sample A was obtained from this unit.

up to 2.0 m Sand: Well sorted medium (predominant) and fine sand, with minor layers of coarse sand; this unit is subhorizontally stratified, with the stratification being locally disrupted by small faults; sample B was obtained from this unit.

up to 3.5 m Slump Covered: Exposures to the north, at this level, reveal sand and fine gravel in lateral contact with sand.

The material in this deposit appears to be predominantly sand. The material exposed on the east side of the esker ridge is all sand, with the sand and gravel

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	94.4	90.8	76.8	59.2	45.7	34.9	14.7	5.6	3.1	2.1
	B	----	----	100.0	99.4	97.3	94.2	64.0	31.0	4.8	1.7
	C										

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 22%	Sound Lithotypes 78%
sandstone 6; felsic intrusive 5; weathered 4; shale 3; metasedimentary 2; chert 1; schist 1	sandstone 24; felsic intrusive 14; greywacke 10; metasedimentary 10; mafic extrusive 6; quartzite 5; quartz 4; siltstone 3; felsic extrusive 2

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
3.5	2	3	60,000

LOCATION #: G12-2 (cont'd)

over sand sequence occurring only to the west.

The northern portion of this deposit is largely depleted. The calculated reserves lie in the southern portion of the deposit.

On the flank of the hill to the east, a small deposit, probably a kame terrace, is present. A small, abandoned pit in this deposit (UTM 031 668) is approximately 7 m deep, and exposes slightly cobbly sand and gravel at the top of the face. However, approximately 50 m to the northwest a logging cut exposes gravelly sand fining downwards through sand to rhythmically interbedded sand and silty clay. Consequently, material quality may be highly variable. This deposit appears to be quite small, and reserves are felt to be limited. Similar deposits may be present elsewhere in the Forest City or McAdam areas, though no others were observed. Since they have no topographic expression visible on aerial photographs, such deposits, if present, would be discovered only by roadbuilding or logging operations which cut through them. In such a case they could constitute a useful local aggregate source.

LOCATION #:	G12-3	NTS:	21 G/12
Type of Deposit:	Ablation till	County:	York
Exposure Type:	Pit	Parish:	North Lake
Status:	Abandoned	UTM:	085 639

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material.

1.4 m Sand and Gravel: Poorly sorted medium to coarse, slightly silty sand and fine to coarse gravel, with occasional cobbles and boulders; maximum clast size is 2 m; clasts are subangular (occasionally angular), with moderate to heavy silt coatings; the material is relatively dense, and appears massive.

2.0 m Slump Covered: Assumed to be material as above.

This pit has been worked in two lifts. The above description pertains to the upper lift. The lower lift, its face slump covered, extends to a maximum of 5.7 m below the surface of the deposit, to the approximate level of the water table.

This deposit is generally hummocky, with a few small ridges. In general, the material consists of sand and gravel, but varies from clean to very silty, with variable quantities of cobbles and boulders.

MECHANICAL ANALYSIS: Wet sieve

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	68.2	61.6	49.3	40.2	32.0	27.0	20.1	11.7	7.3	5.6
	B										
	C										

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 34%	Sound Lithotypes 66%
weathered 13; sandstone 8; siltstone 6; shale 4; schist 3	sandstone 28; greywacke 12; metasedimentary 8; quartzite 4; felsic intrusive 3; argillite 3; quartz 3; mafic intrusive 2; felsic extrusive 1; mafic extrusive 1; siltstone 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m³) probable
			moderate quantities of low-grade material

LOCATION #:	G12-4	NTS:	21 G/12
Type of Deposit:	Ablation till	County:	York
Exposure Type:	Pit	Parish:	North Lake
Status:	Abandoned	UTM:	103 564

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; some iron cementation.

0.8 m Sand and Gravel: Poorly sorted medium to coarse, slightly silty sand and fine to coarse gravel, with occasional cobbles and boulders; maximum clast size is 2 m; clasts are predominantly subangular (occasionally angular or subrounded), with moderate to heavy silt coatings and minor manganese oxide coatings; the deposit appears to exhibit faint, crude stratification.

0.5 m Slump Covered: Assumed to be material as above; the base of the pit lies at the water table.

This deposit is confined to the valley of Musquash Brook. It may include some material of glaciofluvial outwash origin. Similar deposits may be found in similar valleys elsewhere in the Forest City and McAdam areas. Such deposits may constitute useful sources of fill.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		75.6	72.3	63.6	56.6	47.6	39.5	25.3	14.9	8.2	5.0
B											
C											

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 26%	Sound Lithotypes 74%
sandstone 11; felsic intrusive 4; weathered 4; mafic extrusive 2; schist 2; siltstone 1; shale 1; chert 1	sandstone 29; greywacke 12; quartzite 10; metasedimentary 8; quartz 4; felsic extrusive 3; mafic extrusive 3; siltstone 3; felsic intrusive 1; mafic intrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
			moderate quantities of low-grade material

LOCATION #:	G12-5	NTS:	21 G/12
Type of Deposit:	Ice-contact (esker)	County:	York
Exposure Type:	Pit	Parish:	North Lake
Status:	Inactive	UTM:	138 616

SECTION DESCRIPTION & COMMENTS:

0.3 m Overburden: Soil development on the underlying material.

0.7 m Sand: Faintly stratified medium to coarse sand grading downwards into predominantly fine to medium sand; contains occasional small pebbles up to 5 cm in size; lightly oxidized; sample A was obtained from this unit.

0.9 m Silt and Sand: Ripple laminated silty fine sand, with occasional layers of massive silt; not sampled.

0.6 m Gravelly Sand: Horizontally stratified, predominantly medium sand, with minor coarse sand and pebbles, grading downwards into gravelly medium sand; sample B was obtained from this unit.

0.5 m Slump Covered: Assumed to be pebbly sand.

Clasts are predominantly fine to medium gravel size, subangular to subrounded in shape, with light silt coatings, and minor manganese oxide coatings. Maximum clast size is 0.3 m.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing A		----	100.0	99.5	95.5	83.2	69.9	67.1	31.6	13.0	5.4
B		93.2	90.5	85.6	81.3	75.2	66.4	25.4	9.1	5.1	3.4
C	(partial B)				100.0	92.5	81.7	31.3	11.3	6.3	4.2

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 38 %	Sound Lithotypes 62 %
sandstone 16; felsic intrusive 9; weathered 5; shale 2; siltstone 1; chert 1; metasedimentary 1; schist 1; slate 1; manganiferous siltstone 1	sandstone 26; quartzite 10; felsic intrusive 9; metasedimentary 5; mafic extrusive 3; siltstone 3; quartz 2; felsic extrusive 1; mafic intrusive 1; conglomerate 1; argillite 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
5	3	3	90,000

LOCATION #: G12-5 (cont'd)

This deposit forms a low ridge, with a maximum exposure of 4.4 m in the pit. At least 1 m of workable material lies below the base of the pit. However, bedrock is exposed in the bottom of the stream immediately to the north of the pit.

The material in this deposit is generally fine, consisting predominantly of sand and pebbly sand. However, 2 m of sand and gravel is exposed in the southern pit (UTM 137 614).

LOCATION #:	G12-6	NTS:	21 G/12
Type of Deposit:	Ablation till	County:	York
Exposure Type:	Roadside pit	Parish:	North Lake
Status:	Abandoned	UTM:	139 573

SECTION DESCRIPTION & COMMENTS:

0.4 m Overburden: Soil development on the underlying material; surface is quite bouldery.

1.6 m Sand and Gravel: Poorly sorted, silty fine to coarse sand and fine to coarse, cobbly gravel, with abundant boulders; the sample is not representative of the cobble and boulder fraction, which was visually estimated to comprise 20% of the deposit; maximum clast size is 2.5 m; clasts are predominantly angular, with moderate silt coatings; some very crude, horizontal textural stratification is evident.

1.0 m Slump Covered: Assumed to be material as above.

Since most of the cobbles and boulders are granitic in nature, the quality of this material could be significantly improved by crushing and washing.

This deposit is hummocky, with many boggy depressions.

MECHANICAL ANALYSIS: wet sieve

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.4mm	600µm	300µm	150µm	75µm
% passing	A	71.6	68.3	59.9	53.4	48.2	42.0	31.1	21.7	14.1	8.4
	B										
	C										

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 18%	Sound Lithotypes 82%
sandstone 8; felsic intrusive 4; weathered 3; chert 2; shale 1	felsic intrusive 61; sandstone 9; metasedimentary 3; siltstone 2; greywacke 2; argillite 2; quartzite 2; mafic extrusive 1

ESTIMATION OF RESERVES:

total deposit area (hectares)	area workable (hectares)	average thickness (metres)	recoverable reserves (m^3) probable
		variable from nil to 3+ m, generally thin	abundant quantities of low-grade material

PROVINCE DU NOUVEAU-BRUNSWICK
MINISTERE DES RESSOURCES NATURELLES
DIRECTION DE L'EXPLOITATION MINIERE

PLANCHE 82-165

RESSOURCES EN AGREGAT GRANULAIRE de FOREST CITY

21 G/12

DEPOTS

▒ *Sédiments de contact glaciaire (sables ou graviers, ordinairement stratifiés pouvant inclure des blocs et des galets ainsi que des quantités variables de limon ou d'argile)*

⠿ *Till d'ablation (ensemble plus ou moins compact de blocs, cailloux, sables, limon et argile en proportions variables; peut parfois inclure des zones de sables et graviers triés)*

PROVINCE OF NEW BRUNSWICK
DEPARTMENT OF NATURAL RESOURCES
MINERAL DEVELOPMENT BRANCH

PLATE 82-165

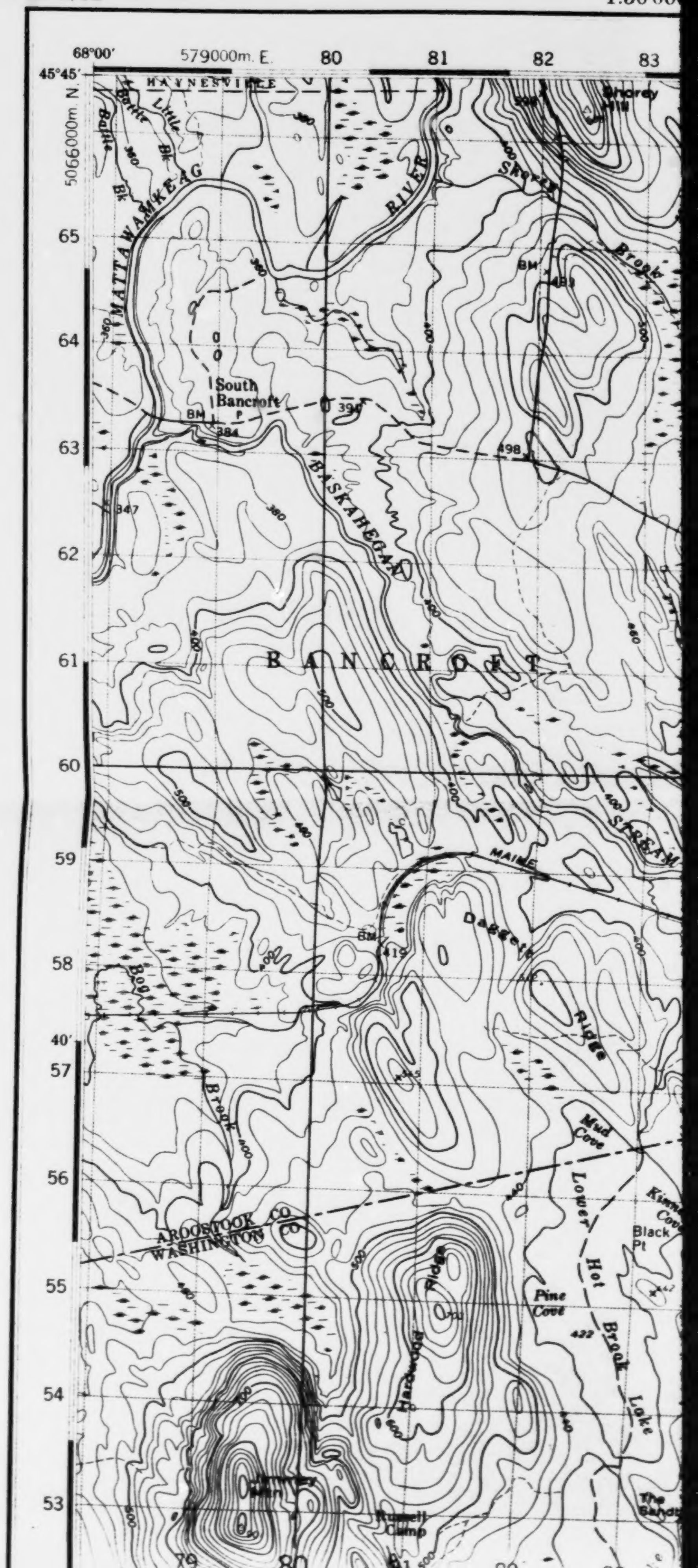
GRANULAR AGGREGATE RESOURCES of FOREST CITY

21 G/12

DEPOSITS

▒ *Ice-contact stratified drift (sand and/or gravel, usually stratified; may contain cobbles and boulders with varying amounts of silt and/or clay)*

⠿ *Ablation till (poorly to moderately compacted agglomeration of boulders, pebbles, sand, silt, and clay in varying proportions; may locally include pockets of sorted sand and gravel)*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45°45'
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5066000m. N.
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40'
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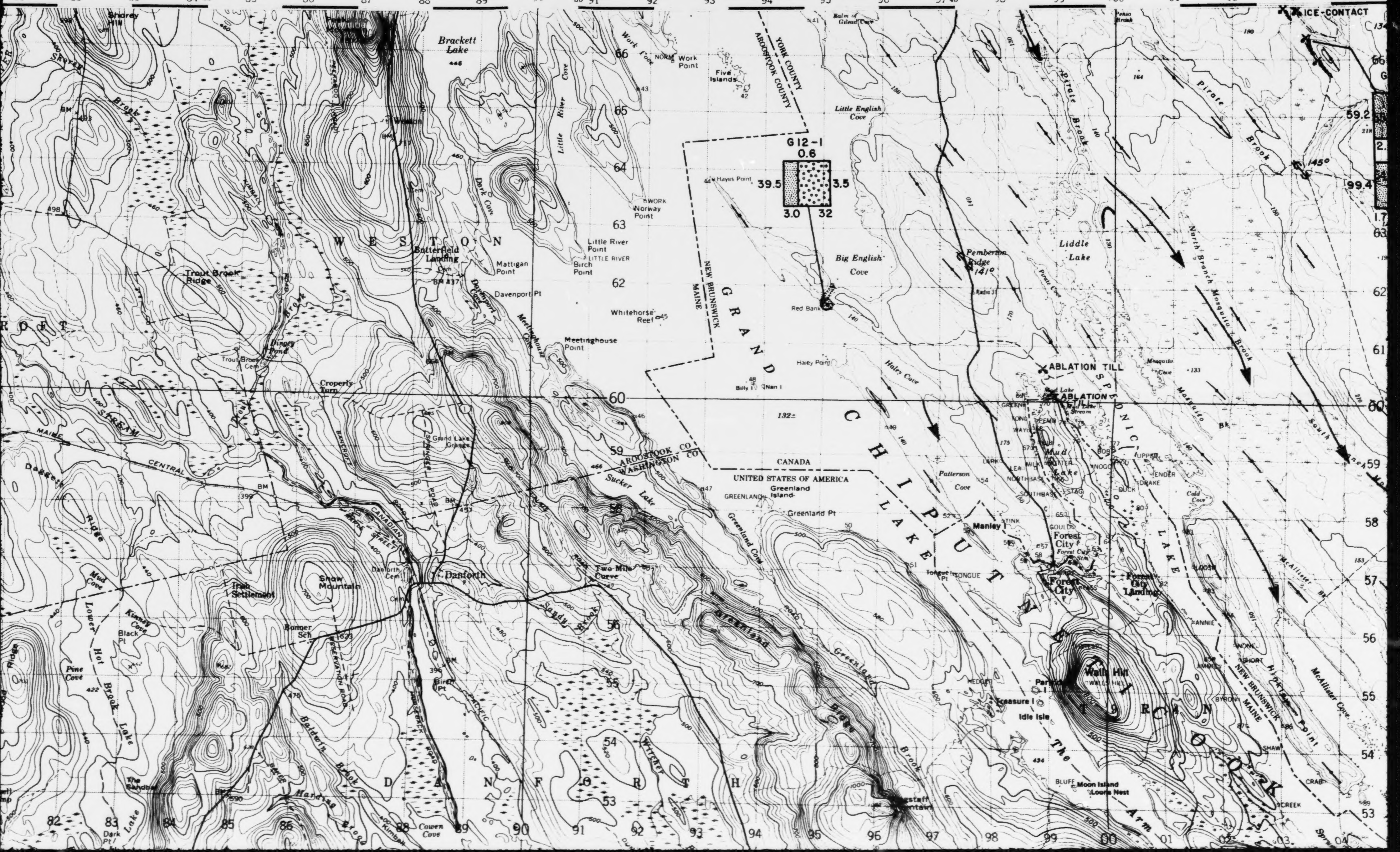
56
55
54
53
HAYNESVILLE
MATTAWAMKEAG
RIVER
Skeehan
Brook
South Bancroft
BASKAHEGAN
BANCROFT
STREAM
MAINE
Daggett
Ridge
Mud Cove
AROOSTOOK CO
WASHINGTON CO
Hardwood
Ridge
Pine Cove
Lower
Hot
Brook
Lake
Black Pt
Russell Camp


ICE-CONTACT
Brackett Lake
Weston
W E S T O N
Butterfield Landing
Mattigan Point
Davenport Pt
Trout Brook Ridge
Dingey Pond
Trout Brook Cem
Croperly Turn
Grand Lake Grange
Meetinghouse Point
Whitehorse Reef
Birch Point
Little River Point
Norway Point
Work Point
Work Cove
Five Islands
Hayes Point
YORK COUNTY
AROOSTOOK COUNTY
NEW BRUNSWICK
MAINE
G12-1
0.6
39.5
3.5
3.0
32
Little English Cove
Big English Cove
Red Bank
Balm of Gilead Cove
Haley Point
Haley Cove
Billy I
Nan I
132±
G R A N D
C H I P U T N E T I C O O K
L A K E
CANADA
UNITED STATES OF AMERICA
Greenland Island
Greenland Pt
Greenland Cove
Greenland Ridge
Greenland Brook
AROOSTOOK CO
WASHINGTON CO
Sucker Lake
Two Mile Cove
Sandy Brook
Danforth
Danforth Cem
Snow Mountain
Irish Settlement
Bonney Sch
Birch Pt
Daggett Ridge
Mud Cove
Kimney Cove
Black Pt
Pine Cove
Lower Hot Brook Lake
Baldwin Brook
Harding Brook
The Sandbar
Cowen Cove
D A N F O R T H
Pemberton Ridge
141°
Patterson Cove
Manley
Tongue Pt
Forest City
Forest City Landing
Walls Hill
Paradise I
Treasure I
Idle Isle
Moon Island
Loons Nest
The Arm
ABLATION TILL
Mud Lake
SPEDNIC LAKE
Liddle Lake
Pirate Brook
North Branch Mosquito Brook
Mosquito Brook
Mosquito Cove
South Branch
McAllister Brook
McAllister Cove
Hipkins Point
Cold Cove
NEW BRUNSWICK
MAINE
145°
59.2
99.4
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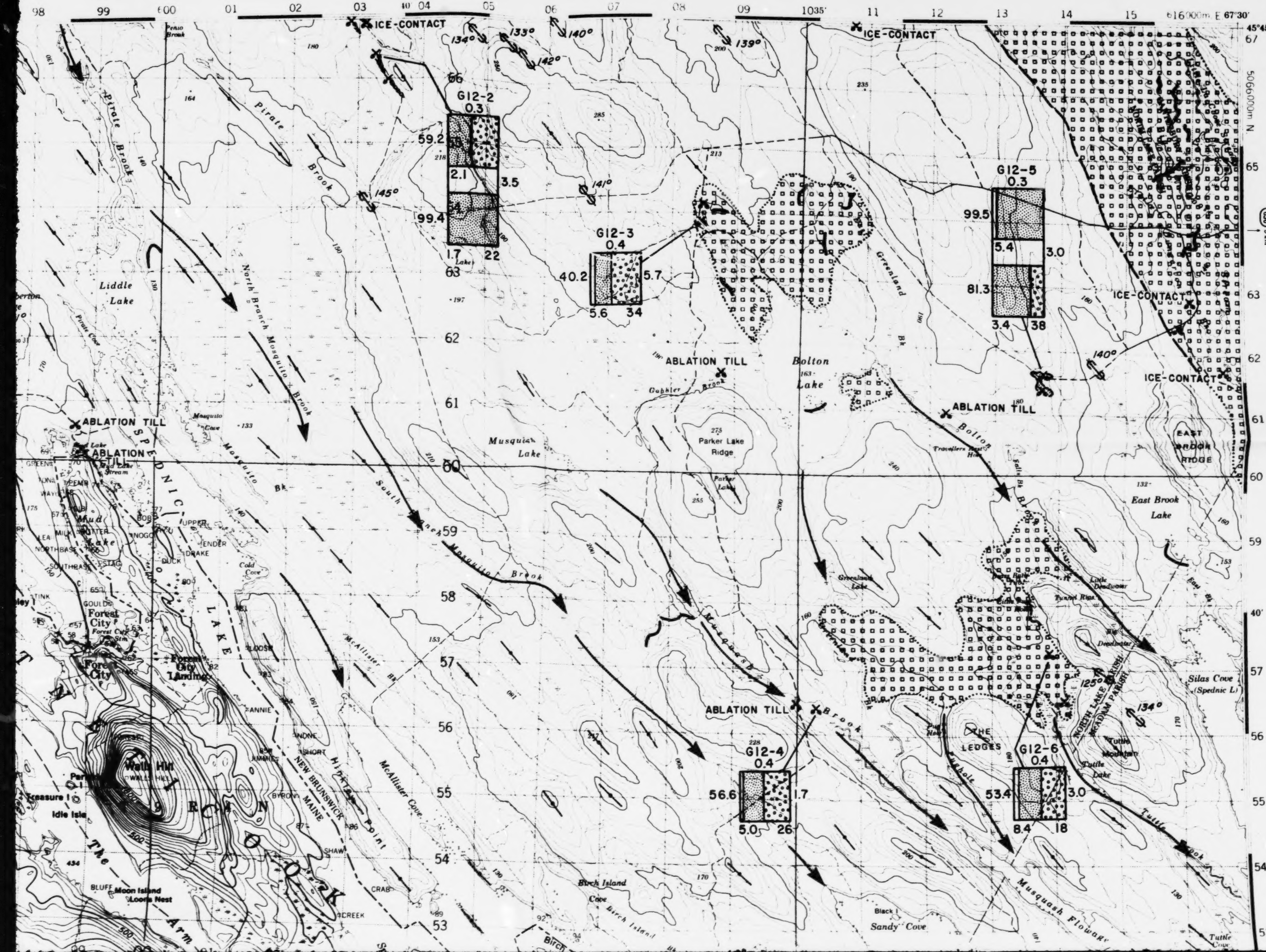
ICE-CONTACT
ICE-CONTACT
ICE-CONTACT
ICE-CONTACT
ABLATION TILL
ABLATION TILL
ABLATION TILL
ABLATION TILL
ABLATION TILL
G12-2
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59.2
2.1
3.5
99.4
1.7
22
G12-3
0.4
40.2
5.7
5.6
34
G12-5
0.3
99.5
5.4
3.0
81.3
3.4
38
G12-4
0.4
56.6
1.7
5.0
26
G12-6
0.4
53.4
3.0
8.4
18
134°
133°
140°
139°
142°
141°
145°
140°
125°
134°
Pirate Brook
Liddle Lake
North Branch Mosquito Brook
Mosquito Brook
South Branch Mosquito Brook
Musquash Lake
Parker Lake Ridge
Parker Lake
Bolton Lake
Greenland Bk
Bolton Brook
Gobbler Brook
Travellers Rest Hole
East Brook Lake
East Brook Ridge
East Bk
Greenland Lake
Little Deadwater
Tunnel Rips
Big Deadwater
The Ledges
Tuttle Mountain
Tuttle Lake
Tuttle Brook
Silas Cove (Spednic L)
North Lake Parish
McAdam Parish
Musquash Brook
Musquash Flowage
Sandy Cove
Birch Island Cove
McAllister Cove
McAllister Bk
Hinkley Point
New Brunswick
Maine
Spednic Lake
Chiputneticook
The Arm
Forest City
Forest City Landing
Mud Lake
Walls Hill
Treasure I
Idle Isle
Moon Island
Loons Nest
Mosquito Cove
Cold Cove
45°45'
40'
67°30'
616000m E
5066000m N.
630
5 km

Reference de cette carte pour usage militaire	MAP 21 G/12 CARTE EDITION 3 MCE EDITION

Digital Mapping · Cartographie Numérique

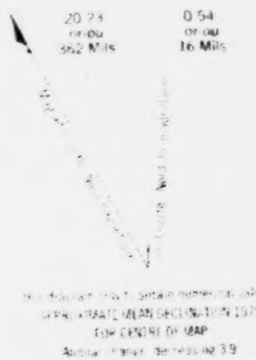
GLOSSARY GLOSSAIRE

Airfield	Terrain d aviation
Arena	Aréna
City Limits	Limites de ville
Customs	Douane
Ditch	Fosse
Dugout	Abreuvoir
Dump	Depotoir
Filtration Plant	Usine de filtration
Gas	Gaz
Golf Course	Terrain de golf
Junk Yard	Ferraille
Kiln	Four
Lookout	Belvedere
Mine Waste	Deblai de mine
Oil Wells	Puits de petrole
Park	Parc
Rink	Patinoire
Senior Citizens Home	Foyer de l âge d or
Ski Area	Station de ski
String Bog	Fondrière a filaments
Surveyed Line	Ligne arpentee
Tank	Reservoir
Water	Eau
Winter Road	Chemin d hiver

For a complete glossary see reverse side
Pour un glossaire complet voir au verso

ABBREVIATIONS ABRÉVIATIONS

Aband	Abandoned	Abandonné, ée
C	Cemetery	Cimetière
CO	County	Comté
E	Elevator	Élévateur
Fy	Ferry	Traversier
IR	Indian Reserve	Réserve indienne
H	Hospital	Hôpital
L	Lot	Lot
Micro	Microwave	Micro ondes
Mun	Municipality	Municipalite
P	Post Office	Bureau de poste
PH	Power House	Centrale electrique
RCMP	Royal Canadian Mounted Police	Gendarmerie Royale Canadienne
Res	Reservoir	Reservoir
Trans Sta	Transformer Station	Poste de transformateurs
TFL	Tree Farm Licence	Licence de sylviculture


20.23
or ou
362 Mils
0.54
or ou
16 Mils

[illegible]
APPROXIMATE MEAN DECLINATION 1979
FOR CENTRE OF MAP
Annual change decreasing 3.9'

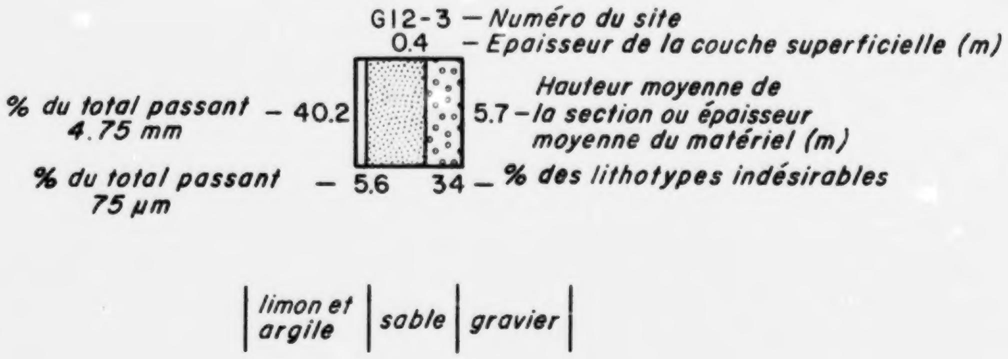
[illegible]
DECLINAISON MOYENNE APPROXIMATIVE
AU CENTRE DE LA CARTE EN 1979
Variation annuelle décroissante 3.9'

ONE THOUSAND METRE

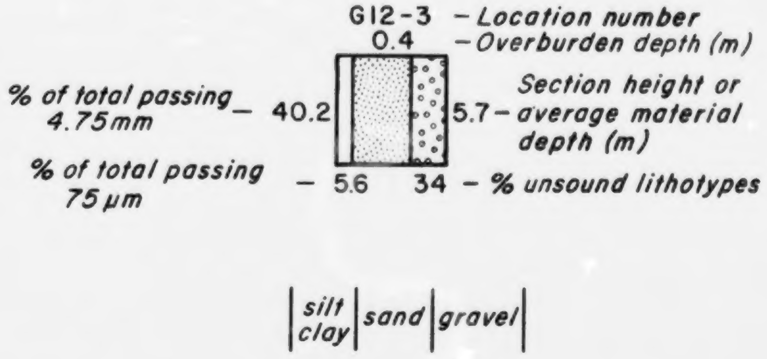
METRIC/MÉT

Stries glaciaires (sens de l'écoulement inconnu; azimut du relèvement en degrés)	⇕	*Glacial striae (direction of ice movement unknown; azimuth of bearings in degrees)*
Drumlin ou surface fuselée	/	*Drumlin or fluted surface*
Esker (direction probable d'écoulement)	>>>>>>>>	*Esker (probable flow direction indicated)*
Chenal de fonte glaciaire (avec la direction probable de l'écoulement)	→	*Glacial drainage channel (with probable flow direction)*
Crête de moraine	∼	*Crest of morainic ridge*
Gravière	×	*Gravel pit*
Numéro d'identification du site	G12-3	*Sample location number*

PROFIL DE L'ECHANTILLON


G12-3 — Numéro du site
0.4 — Epaisseur de la couche superficielle (m)
% du total passant 4.75 mm — 40.2
5.7 — Hauteur moyenne de la section ou épaisseur moyenne du matériel (m)
% du total passant 75 µm — 5.6
34 — % des lithotypes indésirables
limon et argile
sable
gravier

GRADING DIAGRAM

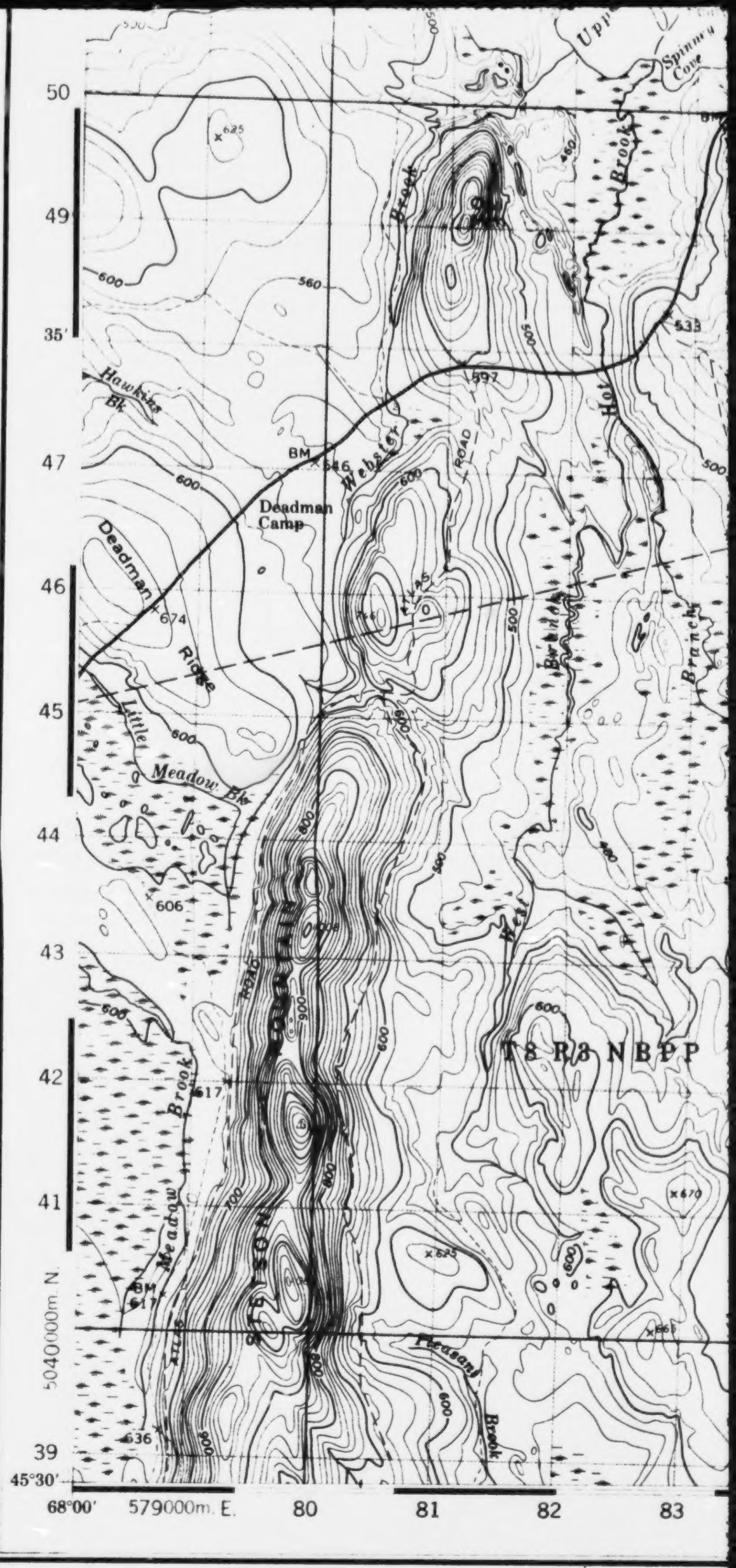

G12-3 — Location number
0.4 — Overburden depth (m)
% of total passing 4.75mm — 40.2
5.7 — Section height or average material depth (m)
% of total passing 75 µm — 5.6
34 — % unsound lithotypes
silt clay
sand
gravel

Cartographié par : A. A. SEAMAN, 1981

Mapped by : A. A. SEAMAN, 1981

Projet financé par l'ENTENTE AUXILIAIRE DE MISE EN VALEUR DES MINERAUX ET DES COMBUSTIBLES CANADA-NOUVEAU-BRUNSWICK

Project funded under the CANADA-NEW BRUNSWICK SUBSIDIARY AGREEMENT, MINERALS AND FUELS DEVELOPMENT


50
49
35'
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43
42
41
5040000m N
39
45°30'
68°00'
579000m. E.
80
81
82
83
Hawkins Bk
BM
Deadman Camp
Deadman Ridge
Webster
ROAD
Little Meadow Bk
Meadow Brook
West Branch
Pleasant Brook
STETSON MOUNTAIN
T8 R3 NBPP
Spinney Cove

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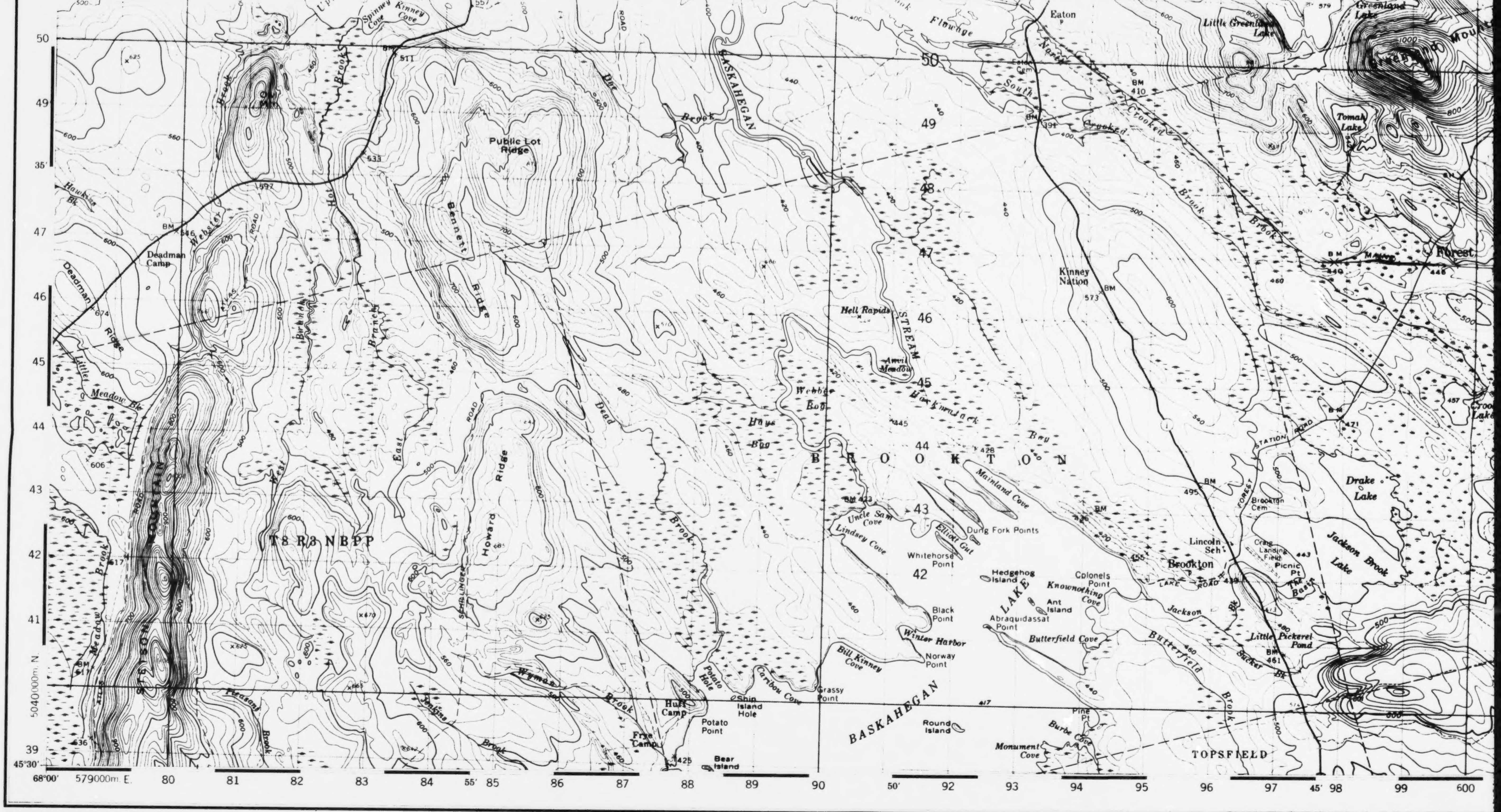
Eaton
Spinney Cove
Kinney Cove
Flowage
Little Greenland Lake
Greenland Lake
Greenland Mountain
North
South
Crooked
Brook
Tomah Lake
BASKAHEGAN
Public Lot Ridge
Bennett Ridge
Hawkins Bk
Deadman Camp
Deadman Ridge
Webster Brook
Little Meadow Bk
Kinney Nation
Forest
Hell Rapids
STREAM
Anvil Meadow
Webber Bog
Hays Bog
Hackmatack Bay
B R O O K T O N
Mainland Cove
Uncle Sam Cove
Lindsey Cove
Elliott Gut
Dung Fork Points
Whitehorse Point
Hedgehog Island
Colonels Point
Knownothing Cove
Ant Island
Abraquidassat Point
Black Point
Winter Harbor
Bill Kinney Cove
Norway Point
Butterfield Cove
Butterfield Brook
LAKE
Caribou Cove
Grassy Point
Ship Island Hole
Potato Hole
Potato Point
Huff Camp
Frye Camp
Bear Island
Round Island
Pine Pt
Burbe Cove
Monument Cove
TOPSFIELD
Howard Ridge
East Branch
West Branch
Dead Brook
T8 R3 NBPP
MOUNTAIN
STETSON
Meadow Brook
Pleasant Brook
Wyman Brook
Jenkins Brook
SCHILLINGER ROAD
Drake Lake
Jackson Brook Lake
Brookton
Brookton Cem
Lincoln Sch
Craig Landing Field
Picnic Pt
The Basin
Jackson Bk
Little Pickerel Pond
Sucker Bk
STATION ROAD
FOREST ROAD
LAKE ROAD
50
49
35′
47
46
45
44
43
42
41
5040000m. N.
39
45°30′
68°00′
579000m. E.
80
81
82
83
84
55′
85
86
87
88
89
90
50′
92
93
94
95
96
97
45′
98
99
600

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Department of Energy, Mines and Resources.

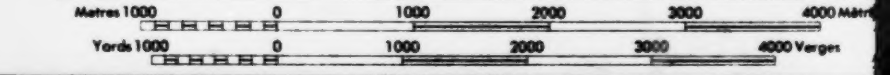
Roads	Routes	2 lanes or more 2 voies ou plus	less than 2 lanes moins de 2 voies
loose or stabilized surface, all weather	gravier, aggloméré, toute saison	━━━━	━━━━
loose surface, dry weather	de gravier, temps sec	— — — —	— — — —
unclassified streets	rues hors classe	------	------
cart track	de terre	— — — —	— — — —
trail, cut line or portage	sentier, percée ou portage	- - - - - -	- - - - - -

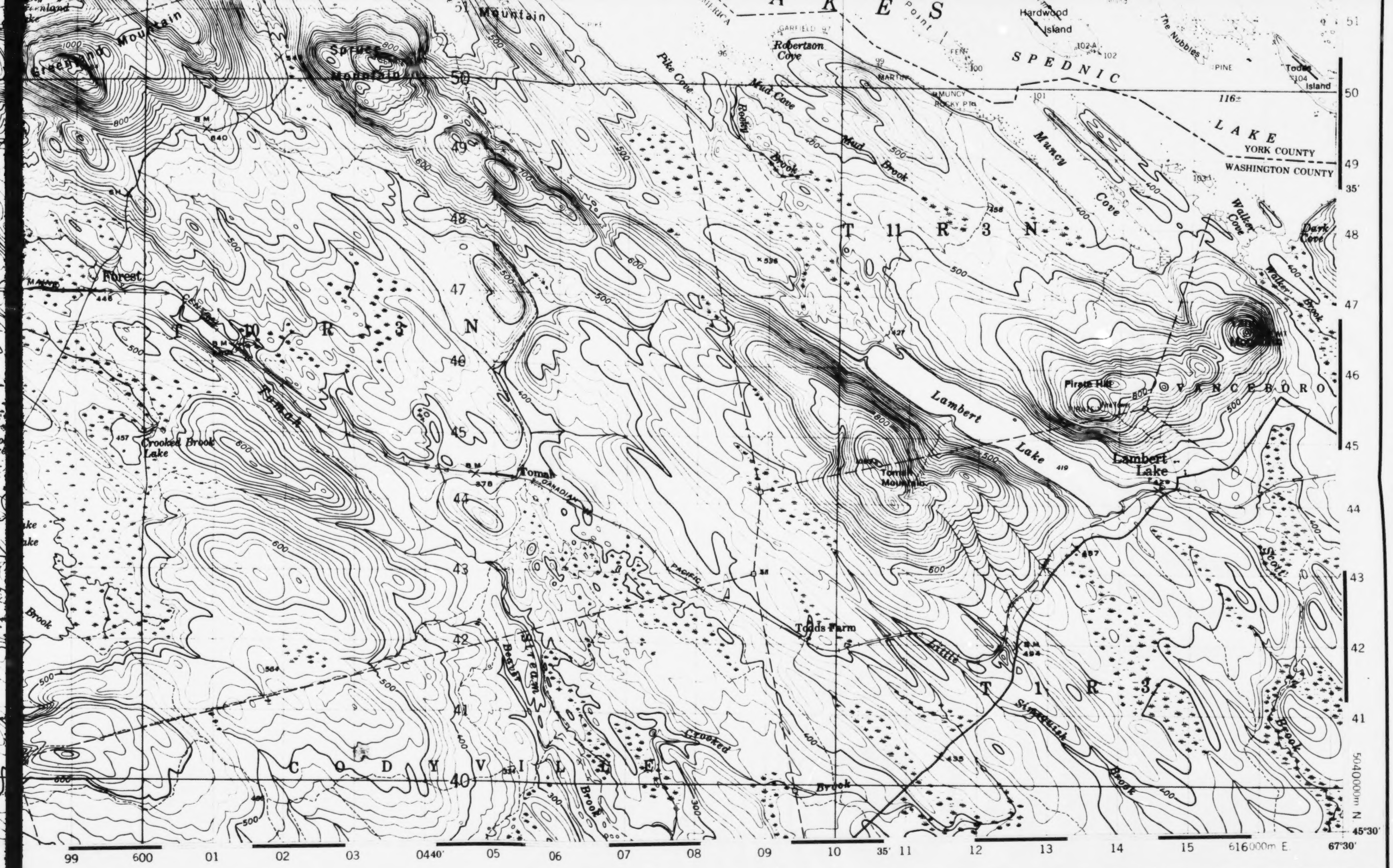
FOR COMPLETE REFERENCE SEE REVERSE SIDE   POUR UNE LISTE COMPLÈTE DES SIGNES, VOIR AU VERSO

FOREST CITY

CANADA - UNITED STATES OF AMERICA

Scale 1:50 000 Échelle


Miles 1
0
1
2
Metres 1000
0
1000
2000
3000
4000 Mètres
Yards 1000
0
1000
2000
3000
4000 Verges


Greenland Mountain
Spruce Mountain
Mountain
Robertson Cove
Hardwood Island
The Nubbles
Todds Island
SPEDNIC LAKE
Point
Pike Cove
Mud Cove
Booky Brook
Mud Brook
Muncy Cove
Walker Cove
Walker Brook
Dark Cove
YORK COUNTY
WASHINGTON COUNTY
T 11 R 3 N
T 10 R 3 N
Forest
Tomah
Crooked Brook Lake
Tomah
Lambert Lake
Lambert Lake
Pirate Hill
VANCEBORO
Tomah Mountain
CANADIAN PACIFIC
Todds Farm
Little Tomah
Scott Brook
Beaver Stream
T 1 R 3
Sinquish Brook
Crooked Brook
CODYVILLE
Brook
Brook
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67°30'
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35'
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ITY

S OF AMERICA

lle

2 3 Milles

3000 4000 Mètres

3000 4000 Verges

Information concerning location and precise elevation of bench marks can be obtained by writing to the Geodetic Survey, Surveys and Mapping Branch, Ottawa

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CONVERSION SCALE FOR ELEVATIONS ÉCHELLE DE CONVERSION DES ALTITUDES

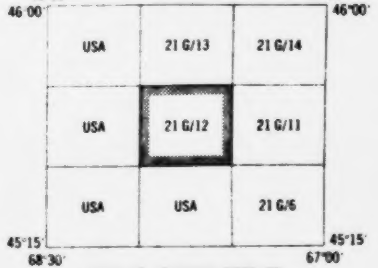
Metres 30 20 10 0 50 100 150 200 250 300 Mètres

Feet 100 50 0 100 200 300 400 500 600 700 800 900 1000 Pieds

CONTOUR INTERVAL 10 METRES IN CANADA
Elevations in Metres above Mean Sea Level
CONTOUR INTERVAL 20 FEET IN U.S.A.
North American Datum 1927

ÉQUIDISTANCE DES COURBES AU CANADA 10 MÈTRES
Altitudes en mètres
ÉQUIDISTANCE DES COURBES AUX É-U.A. 20 PIEDS
Système de référence géodésique nord-américain, 1927

TABLEAU D'ASSEMBLAGE DU SYSTÈME NATIONAL DE RÉFÉRENCE CARTOGRAPHIQUE


68°30'
67°00'
46°00'
46°00'
USA
21 G/13
21 G/14
USA
21 G/12
21 G/11
USA
USA
21 G/6
45°15'
45°15'
68°30'
67°00'

INDEX TO ADJOINING MAPS OF THE NATIONAL TOPOGRAPHIC SYSTEM

Établie par la DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES, à l'aide de photographies aériennes prises en 1975. Vérification des ouvrages en 1976. Publiée en 1980. Partie américaine reproduite en partie d'après des cartes de 1940 et 1958 fournies par le GEOLOGICAL SURVEY DES ÉTATS-UNIS.

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Ministère de l'Énergie, des Mines et des Ressources.

FOREST CITY
21 G/12
EDITION 3

PROVINCE DU NOUVEAU-BRUNSWICK
MINISTERE DES RESSOURCES NATURELLES
DIRECTION DE L'EXPLOITATION MINIERE

PLANCHE 82-164

RESSOURCES EN AGREGAT GRANULAIRE de McADAM

21 G/11

PROVINCE OF NEW BRUNSWICK
DEPARTMENT OF NATURAL RESOURCES
MINERAL DEVELOPMENT BRANCH

PLATE 82-164

GRANULAR AGGREGATE RESOURCES of McADAM

21 G/11

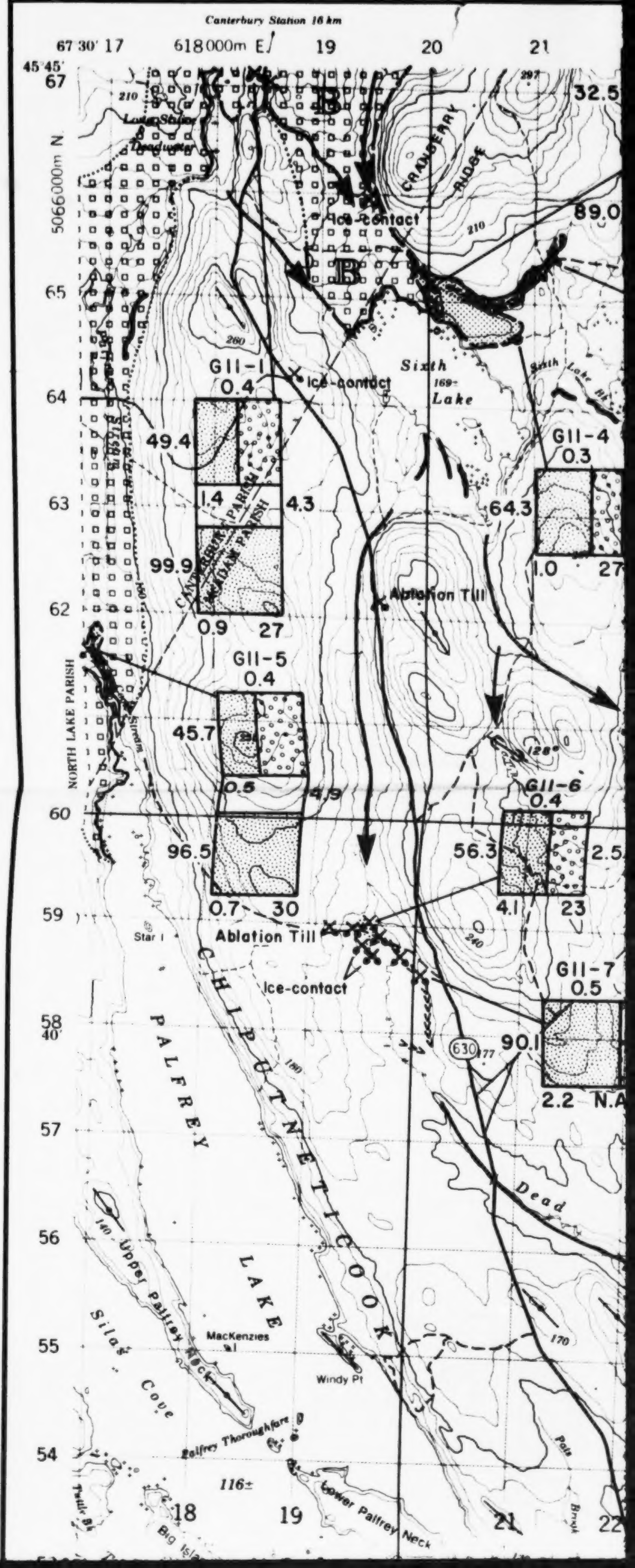
DEPOTS / DEPOSITS

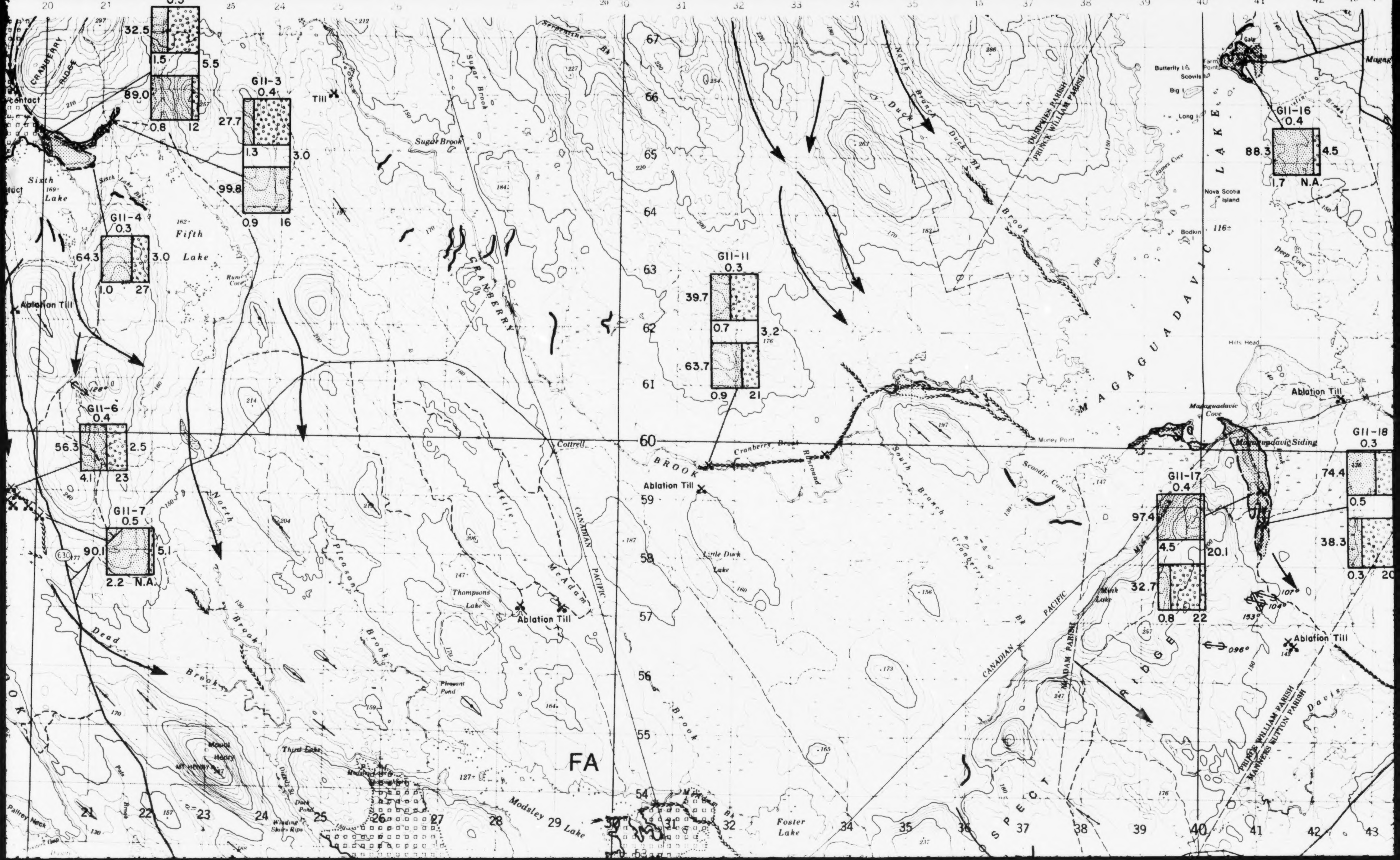
DEPOTS		DEPOSITS
Epandage fluvio-glaciaire (surtout des sables et graviers)	▒	*Glaciofluvial outwash (mainly sand and gravel)*
Sédiments de contact glaciaire (sables ou graviers, ordinairement stratifiés pouvant inclure des blocs et des galets ainsi que des quantités variables de limon ou d'argile)	░	*Ice-contact stratified drift (sand and/or gravel, usually stratified; may contain cobbles and boulders with varying amounts of silt and/or clay)*
Till d'ablation (ensemble plus ou moins compact de blocs, cailloux, sables, limon et argile en proportions variables; peut parfois inclure des zones de sables et graviers triés); 𝔹 *– abondance de blocs*	⊡	*Ablation till (poorly to moderately compacted agglomeration of boulders, pebbles, sand, silt and clay in varying proportions; may locally include pockets of sorted sand and gravel);* 𝔹 *– very bouldery*

SYMBOLES / SYMBOLS

SYMBOLES		SYMBOLS
Pourtour géologique (déterminé, approximatif, déduit)	/ / ⁄	*Geological boundary (defined, approximate, inferred)*
Stries glaciaires (sens de l'écoulement connu, inconnu; azimut du relèvement en degrés)	↗ ↕	*Glacial striae (direction of ice movement known, unknown; azimuth of bearings in degrees)*
Drumlin ou surface fuselée	/	*Drumlin or fluted surface*
Esker (direction probable d'écoulement)	>>>>>>>>>>>>>>>	*Esker (probable flow direction indicated)*
Chenal de fonte glaciaire (avec la direction probable de	→	*Glacial drainage channel (with*

MÉTRIQUE


Canterbury Station 16 km
67°30' 17
618000m E.
19
20
21
45°45'
5066000m N.
67
65
64
63
62
60
59
58
40'
57
56
55
54
18
19
21
22
32.5
89.0
CRANBERRY RIDGE
Ice-contact
Sixth Lake
Sixth Lake
G11-1
0.4
49.4
1.4
4.3
99.9
0.9
27
CANTERBURY PARISH
McADAM PARISH
NORTH LAKE PARISH
G11-4
0.3
64.3
1.0
Ablation Till
G11-5
0.4
45.7
0.5
4.9
96.5
0.7
30
G11-6
0.4
56.3
2.5
4.1
23
Ablation Till
Ice-contact
G11-7
0.5
90.1
2.2
N.A
630
PALFREY
CHIPUTNETICOOK
LAKE
Dead
Upper Palfrey Neck
Silas Cove
MacKenzies
Windy Pt
Palfrey Thoroughfare
Lower Palfrey Neck
Big Isle
116±



G11-3
0.4
27.7
1.3
3.0
99.8
0.9
16
32.5
1.5
5.5
89.0
0.8
12
G11-4
0.3
64.3
3.0
1.0
27
G11-6
0.4
56.3
2.5
4.1
23
G11-7
0.5
90.1
5.1
2.2
N.A.
G11-11
0.3
39.7
0.7
3.2
63.7
0.9
21
G11-16
0.4
88.3
4.5
1.7
N.A.
G11-17
0.4
97.4
4.5
20.1
32.7
0.8
22
G11-18
0.3
74.4
0.5
38.3
0.3
20
CRANBERRY RIDGE
contact
Sixth Lake
Sixth Lake Bk
Fifth Lake
Rum Cove
Ablation Till
Till
Sugar Brook
CRANBERRY
Serpentine Bk
North Branch Duck Bk
Duck Brook
DUMFRIES PARISH
PRINCE WILLIAM PARISH
Butterfly I.
Scovils I.
Farm Point
Gate
Big I.
Long I.
James Cove
Nova Scotia Island
Bodkin
Deep Cove
MAGAGUADAVIC LAKE
Hills Head
Magaguadavic Cove
Magaguadavic Siding
Money Point
Scoodic Cove
Cottrell
BROOK
Cranberry Brook
Rimround
South Branch
Cranberry Bk
Little Duck Lake
Little McAdam
CANADIAN PACIFIC
North Brook
Pleasant Brook
Thompsons Lake
Pleasant Pond
Dead Brook
Mount Henry
MT HENRY
Third Lake
Digdeguash
Duck Pond
Winding Stairs Rips
Modsley Lake
McAdam Bk
Foster Lake
Mink Lake
McADAM PARISH
PROSPECT RIDGE
PRINCE WILLIAM PARISH
MANNERS SUTTON PARISH
Davis
Palfrey Neck
Pats Brook
FA
128°
107°
104°
153°
096°
630
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
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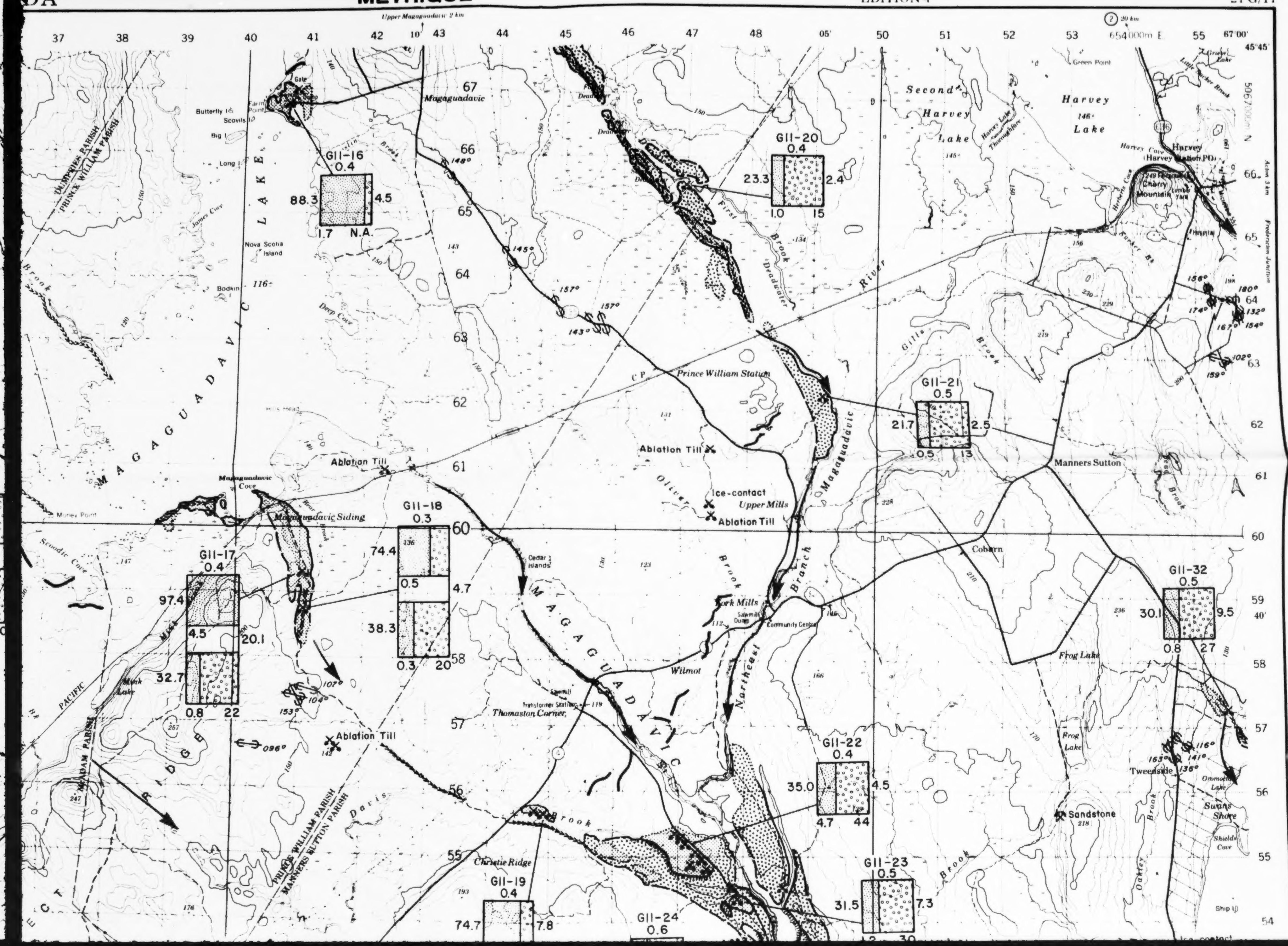
65
66
67


METRIQUE
EDITION 4
21 G/11
Upper Magaguadavic 2 km
20 km
654000m E.
67°00'
45°45'
5067000m N
Acton 3 km
Fredericton Junction
Second Harvey Lake
Harvey Lake
Green Point
Harvey
Harvey Station P.O.
Cherry Mountain
Magaguadavic
MAGAGUADAVIC LAKE
DUMFRIES PARISH
PRINCE WILLIAM PARISH
MANNERS SUTTON PARISH
MCADAM PARISH
Butterfly I.
Scovils I.
Big I.
Long I.
James Cove
Nova Scotia Island
Bodkin I.
Deep Cove
Magaguadavic Cove
Magaguadavic Siding
Money Point
Scoodic Cove
Prince William Station
Deadwater Brook
First Brook
Magaguadavic River
Oliver Brook
Upper Mills
York Mills
Community Centre
Northeast Branch
Wilmot
Thomaston Corner
Transformer Station
Davis Brook
Christie Ridge
Manners Sutton
Coburn
Gills Brook
Frog Lake
Sandstone
Tweedside
Oromocto Lake
Swans Shore
Shields Cove
Oakley Brook
Ablation Till
Ice-contact
G11-16
0.4
88.3
4.5
1.7
N.A.
G11-17
0.4
97.4
4.5
20.1
32.7
0.8
22
G11-18
0.3
74.4
0.5
4.7
38.3
0.3
20
G11-19
0.4
74.7
7.8
G11-20
0.4
23.3
2.4
1.0
15
G11-21
0.5
21.7
2.5
0.5
13
G11-22
0.4
35.0
4.5
4.7
44
G11-23
0.5
31.5
7.3
G11-24
0.6
G11-32
0.5
30.1
9.5
0.8
27
148°
145°
157°
143°
107°
104°
153°
096°
156°
174°
180°
132°
154°
167°
102°
159°
163°
141°
116°
136°
METRIC/MÉT

Military users refer to this map as Reference de cette carte pour usage militaire	SERIES	[illegible]	SÉRIE
	MAP	21 G 11	CARTE
	EDITION	4 MCE	ÉDITION

Digital Mapping
Cartographie Numérique

GLOSSARY GLOSSAIRE

Airfield	Terrain d aviation
Arena	Arena
City Limits	Limites de ville
Customs	Douane
Ditch	Fosse
Dugout	Abreuvoir
Dump	Depotoir
Filtration Plant	Usine de filtration
Gas	Gaz
Golf Course	Terrain de golf
Junk Yard	Ferraille
Kiln	Four
Lookout	Belvedere
Mine Waste	Deblai de mine
Oil Wells	Puits de petrole
Park	Parc
Rink	Patinoire
Senior Citizens Home	Foyer de l age d or
Ski Area	Station de ski
String Bog	Fondriere a filaments
Surveyed Line	Ligne arpentee
Tank	Reservoir
Water	Eau
Winter Road	Chemin d hiver

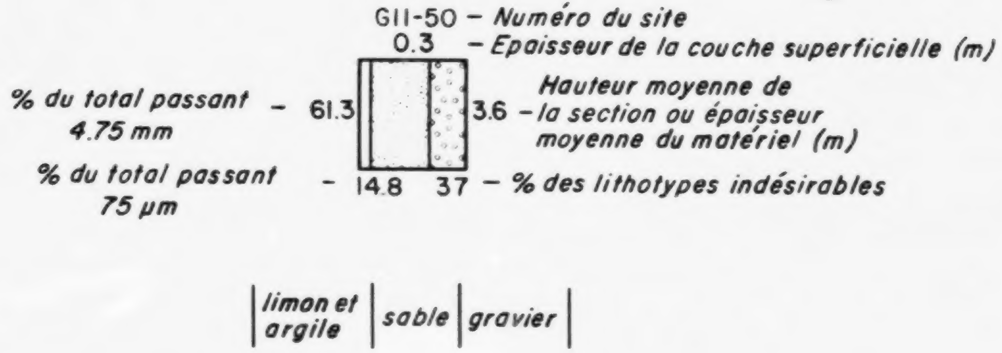
For a complete glossary see reverse side
Pour un glossaire complet voir au verso

ABBREVIATIONS ABRÉVIATIONS

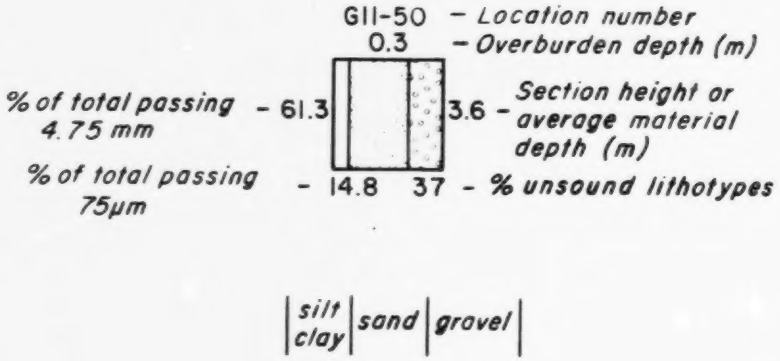
Aband	Abandoned	Abandonne, ee
C	Cemetery	Cimetière
CO	County	Comté
E	Elevator	Élévateur
Fy	Ferry	Traversier
IR	Indian Reserve	Réserve indienne
H	Hospital	Hôpital
L	Lot	Lot
Micro	Microwave	Micro ondes
Mun	Municipality	Municipalite
P	Post Office	Bureau de poste
PH	Power House	Centrale electrique
RCMP	Royal Canadian Mounted Police	Gendarmerie Royale Canadienne
Res	Reservoir	Reservoir
Trans Sta	Transformer Station	Poste de transformateurs
TFL	Tree Farm Licence	Licence de sylviculture

Escarpement (les hachures indiquent la pente)	┬┬┬	*Top of scarp (hachures on slope)*
Crête de moraine	⌒	*Crest of morainic ridge*
Gravière	×	*Gravel pit*
Carrière	⚒	*Bedrock quarry*
Site d'échantillonnage (autre que gravière)	•	*Sample location (other than gravel pit)*
Numéro d'identification du site	GII-50	*Sample location number*
Non disponible	N.A.	*Not available*

PROFIL DE L'ECHANTILLON


GII-50 – *Numéro du site*
0.3 – *Epaisseur de la couche superficielle (m)*
% du total passant 4.75 mm – 61.3
3.6 – *Hauteur moyenne de la section ou épaisseur moyenne du matériel (m)*
% du total passant 75 µm – 14.8
37 – *% des lithotypes indésirables*
limon et argile
sable
gravier

GRADING DIAGRAM

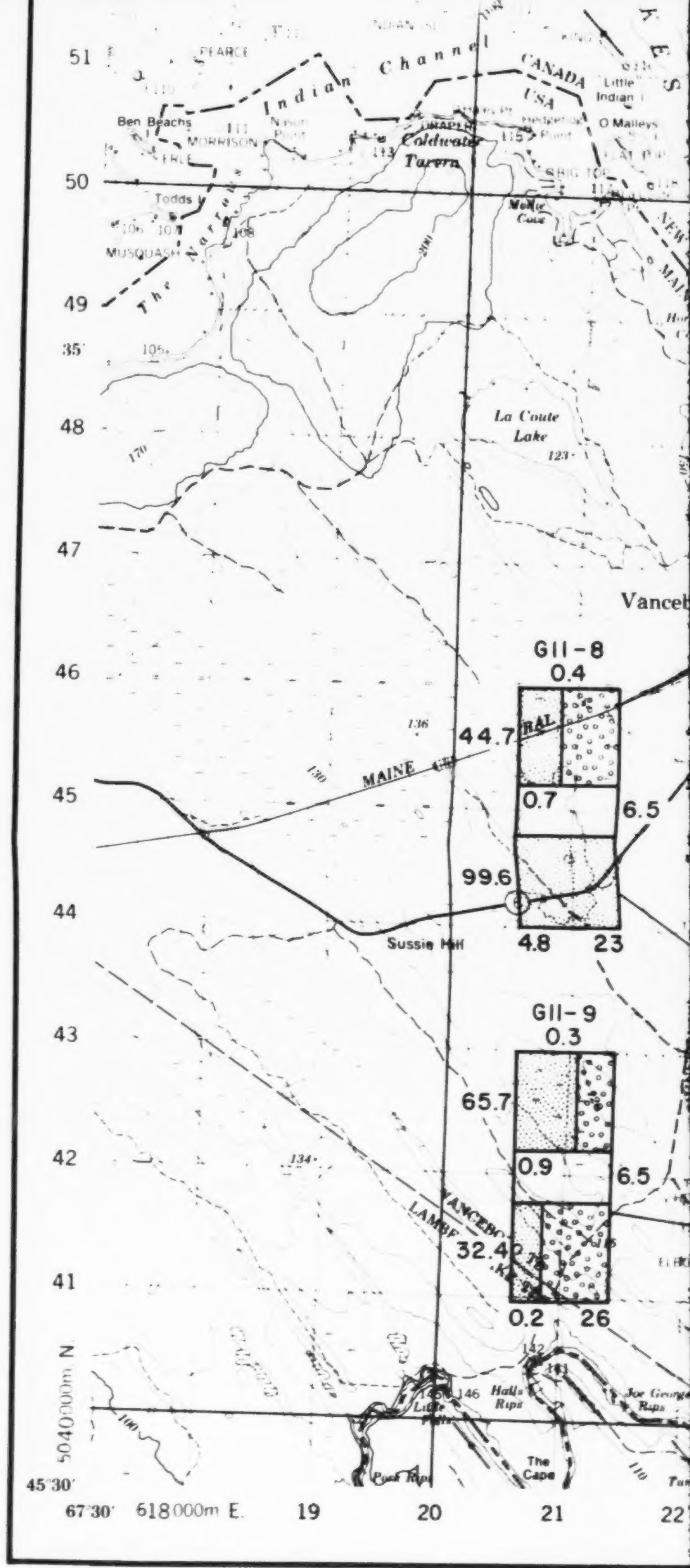

GII-50 – *Location number*
0.3 – *Overburden depth (m)*
% of total passing 4.75 mm – 61.3
3.6 – *Section height or average material depth (m)*
% of total passing 75µm – 14.8
37 – *% unsound lithotypes*
silt clay
sand
gravel

Cartographié par : A. A. SEAMAN, 1981

Mapped by: A. A. SEAMAN, 1981

Projet financé par l'ENTENTE AUXILIAIRE DE MISE EN
VALEUR DES MINERAUX ET DES
COMBUSTIBLES CANADA-NOUVEAU-BRUNSWICK

Project funded under the CANADA-NEW BRUNSWICK
SUBSIDIARY AGREEMENT,
MINERALS AND FUELS DEVELOPMENT


51
50
49
35'
48
47
46
45
44
43
42
41
45°30'
5040000m N.
67°30'
618000m E.
19
20
21
22
Indian Channel
CANADA
USA
Ben Beachs
Coldwater Tavern
Todds
MUSQUASH
La Coute Lake
Vanceb
GII-8
0.4
44.7
0.7
6.5
99.6
4.8
23
Sussie Hill
MAINE
GII-9
0.3
65.7
0.9
6.5
32.4
0.2
26
LAMBE
VANCEBO
Halls Rips
The Cape
Joe George Rips

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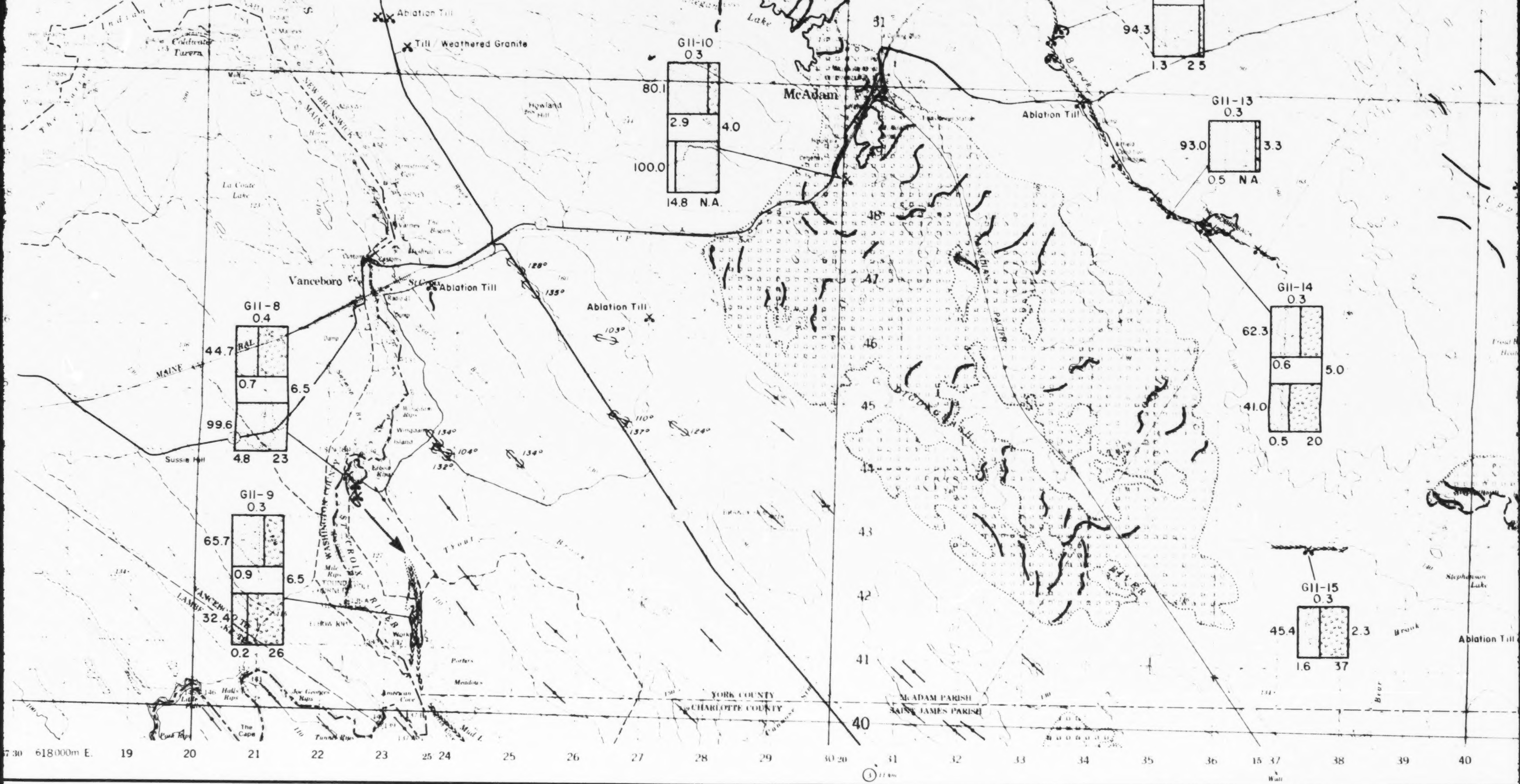
Ablation Till
Till / Weathered Granite
G11-10
0.3
80.1
2.9
4.0
100.0
14.8
N.A.
McAdam
94.3
1.3
2.5
G11-13
0.3
93.0
3.3
0.5
N.A.
Ablation Till
Vanceboro
Ablation Till
Ablation Till
G11-8
0.4
44.7
0.7
6.5
99.6
4.8
23
Sussie Hill
G11-9
0.3
65.7
0.9
6.5
32.4
0.2
26
G11-14
0.3
62.3
0.6
5.0
41.0
0.5
20
G11-15
0.3
45.4
2.3
1.6
37
Ablation Till
128°
135°
103°
110°
137°
124°
134°
104°
132°
134°
YORK COUNTY
CHARLOTTE COUNTY
McADAM PARISH
SAINT JAMES PARISH
48
47
46
45
44
43
42
41
40
618000m E.
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

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ENT OF ENERGY, MINES AND RESOURCES.
photographs taken in 1974. Culture check 1975
1980
copied in part from maps dated 1933 supplied by
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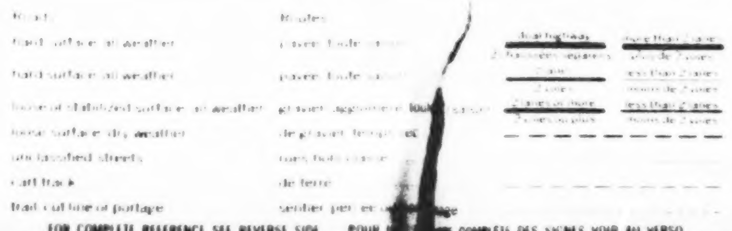

Roads
Routes

FOR COMPLETE REFERENCE SEE REVERSE SIDE
POUR [illegible] COMPLETE DES SIGNES VOIR AU VERSO

McADAM

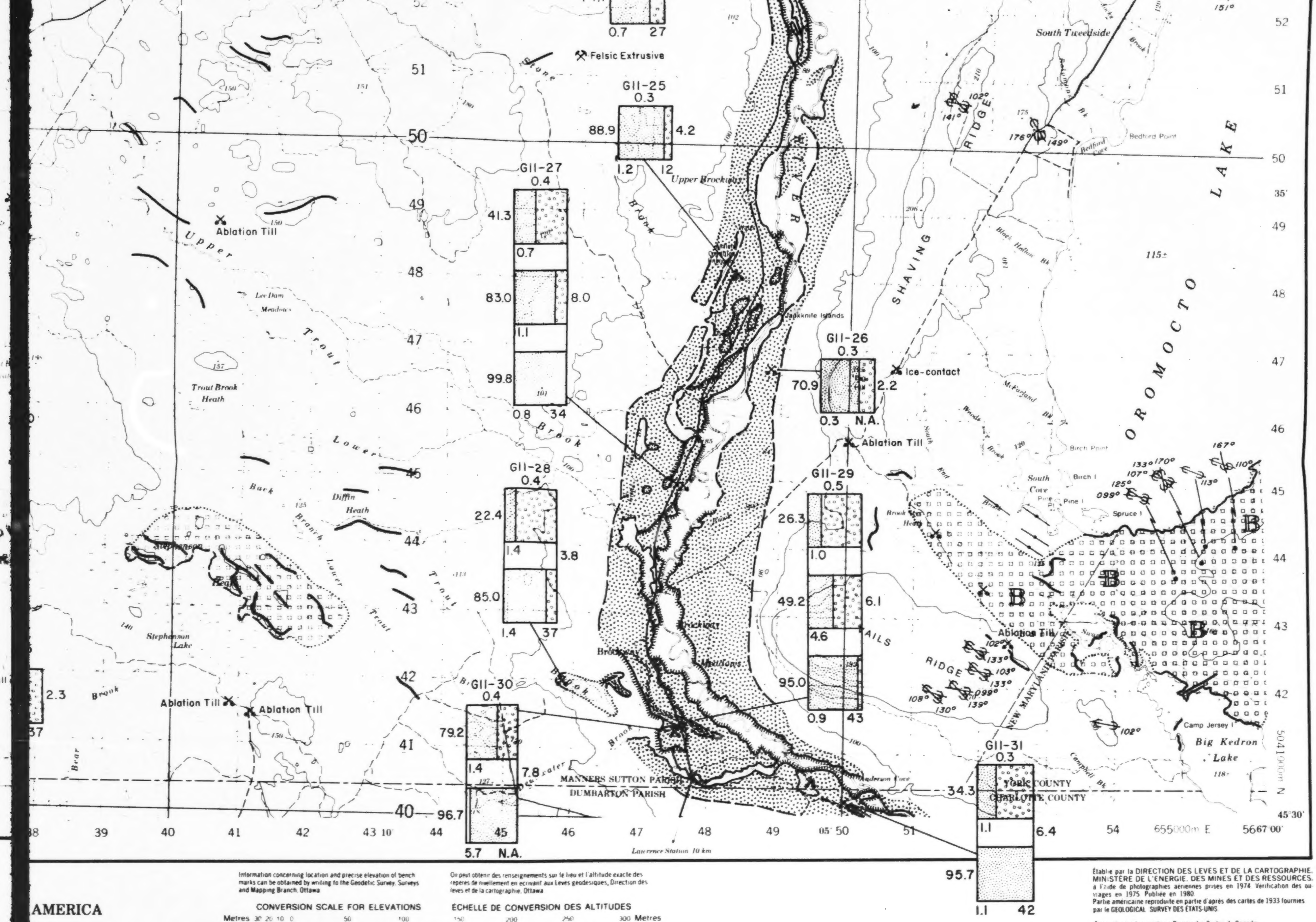
CANADA - UNITED STATES OF AMERICA

Scale 1:50 000 Échelle

Miles 1 0 1 2 3 Miles

Metres 1000 0 1000 2000 3000 4000 Mètres

Yards 1000 0 1000 2000 3000 4000 Verges


0.7 27
Felsic Extrusive
G11-25
0.3
88.9
4.2
1.2 12
G11-27
0.4
41.3
0.7
83.0
8.0
1.1
99.8
0.8 34
G11-26
0.3
70.9
2.2
0.3 N.A.
Ice-contact
Ablation Till
G11-28
0.4
22.4
1.4
3.8
85.0
1.4 37
G11-29
0.5
26.3
1.0
49.2
6.1
4.6
95.0
0.9 43
G11-30
0.4
79.2
1.4
7.8
96.7
5.7 N.A.
G11-31
0.3
34.3
1.1
6.4
95.7
1.1 42
2.3
37
South Tweedside
SHAVING RIDGE
OROMOCTO LAKE
RIVER
Upper Brockway
Upper Trout Brook
Lower Trout Brook
Lee Dam Meadows
Trout Brook Heath
Back Branch
Diffin Heath
Stephenson Heath
Stephenson Lake
Jackknife Islands
Bedford Point
Bedford Cove
Black Hollow Bk
McFarland Bk
South Cove
Birch Point
Birch I
Pine I
Spruce I
Camp Jersey I
Big Kedron Lake
NEW MARYLAND PARISH
MANNERS SUTTON PARISH
DUMBARTON PARISH
YORK COUNTY
CHARLOTTE COUNTY
Laurence Station 10 km
Ablation Till
Ablation Till
Ablation Till
Ablation Till
B
151°
102°
141°
176°
149°
133°
170°
107°
125°
099°
167°
110°
113°
102°
133°
103°
133°
108°
130°
099°
139°
102°
52
51
50
49
48
47
46
45
44
43
42
41
40
35′
45°30′
5041000m N
38 39 40 41 42 43 10′ 44 45 46 47 48 49 05′ 50 51 54 655000m E 56 67°00′

AMERICA

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Metres 30 20 10 0 50 100 150 200 250 300 Metres

Feet 100 50 0 100 200 300 400 500 600 700 800 900 1000 Pieds

2 3 Milles

3000 4000 Mètres

4000 Verges

CONTOUR INTERVAL 10 METRES
Elevations in Metres above Mean Sea Level
North American Datum 1927

ÉQUIDISTANCE DES COURBES 10 MÈTRES
Altitudes en mètres
Système de référence géodésique nord américain 1927

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Ministère de l'Énergie, des Mines et des Ressources

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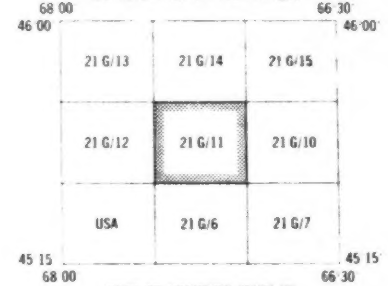
68 00
66 30
46 00
46 00
21 G/13
21 G/14
21 G/15
21 G/12
21 G/11
21 G/10
USA
21 G/6
21 G/7
45 15
45 15
68 00
66 30

INDEX TO ADJOINING MAPS OF THE NATIONAL TOPOGRAPHIC SYSTEM

McADAM
21 G/11
EDITION 4